Heating Piping & Air Conditioning

DESIGN
INSTALLATION
OPERATION
MAINTENANCE

MAY ★ 1953

INDUSTRIAL
COMMERCIAL
INSTITUTIONAL AND
PUBLIC BUILDINGS

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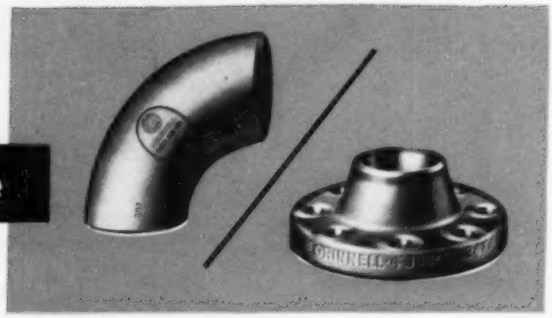
for trouble-free service



GRINNELL

STAINLESS STEEL WELDING FITTINGS and FLANGES

To help combat mounting costs in the installation and maintenance of piping systems where corrosive or certain other service conditions are involved, Grinnell offers a comprehensive range of welding fittings and flanges in stainless steel.

- **To prevent corrosive attack.**
- **To obtain adequate impact resistance at low temperatures and sufficient creep strength at high temperatures.**
- **To provide sanitary conditions.**
- **To avoid contaminating the product.**

Grinnell welding fittings and flanges are available in types 304, 347 and 316. These are in the chromium-nickel grades known as "18-8". The corrosion resistant properties of stainless steels are primarily due to the chromium content which ranges from 17% to 20%. The addition of nickel in ranges from 7% to 14% improves the corrosion resistance as well as the properties at elevated temperatures. A molybdenum addition of 2% to 3%, as found in type 316, increases the resistance to sulphurous and phosphoric acids, brine and hypochlorite solutions, and improves the general resistance to other corrosive liquids, as well as improving the physical properties at elevated temperatures. A columbium addition of approximately 0.4% to 1.0%, as found in type 347, creates non-susceptibility to carbide precipitation which can cause intergranular corrosion.

In addition to stainless steel, Grinnell offers welding fittings and flanges in carbon steel, nickel, Inconel, Monel, aluminum and brass.

Write for new booklet giving complete data on Grinnell stainless steel welding fittings and flanges. No obligation.

stainless steel welding fittings
Types 304, 347, 316

DESCRIPTION	SCHEDULE†	PIPE SIZE, IN.‡
90° Long Radius Elbow 45° Long Radius Elbow 180° Long Radius Return Straight Tee	5s, 10s, 40s, 80s	½ to 12
Reducing Tee	5s, 10s, 40s, 80s	¾ to 12
Cross (Straight and Reducing)	5s, 10s, 40s, 80s	1¼ to 12
Concentric Reducer Eccentric Reducer	5s, 10s, 40s, 80s	¾ to 12
Lateral (Straight or Reducing)	5s, 10s, 40s, 80s	1 to 12
Cap	5s, 10s, 40s, 80s	½ to 12
Lap Joint Stub End-Long	10s, 40s, 80s	½ to 12
Lap Joint Stub End-Short	5s, 10s, 40s,	½ to 12

† 5s is Featherweight, 10s Lightweight, 40s Standard, 80s Extra Strong.
‡ Larger sizes available on special order.

stainless steel flanges

150 lb. and 300 lb. Steel Flange Standard *(Higher series available on application).*

DESCRIPTION	PIPE SIZE, IN.
Welding Neck Slip-on Lap Joint Threaded Socket Type Blind	½ to 24

150 lb. Corrosion Resistant Standard. *(For use with schedule 10s and 5s pipe. Rated at 150 psi at 500°F, 225 psi at 150°F, when used with full-faced gaskets).*

DESCRIPTION	PIPE SIZE, IN.
Buttwelding Slip-on Blind	½ to 12

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WHENEVER PIPING IS INVOLVED

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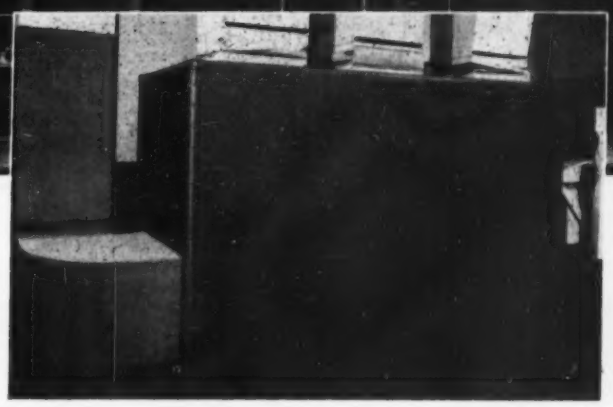
Grinnell-Saunders diaphragm valves • pipe • prefabricated piping • plumbing and heating specialties • water works supplies
industrial supplies • Grinnell automatic sprinkler fire protection systems • Amco air conditioning systems

ECONOMY OF INSTALLATION AND OPERATION SELLS SHOPWELL ON

usAIRco RK UNIT



One 25 h.p. Central Station Unit Cools New Rochelle Super Market

When Shopwell Super Markets air condition a modern super market, economy of installation and operation are the two major factors in the decision.

Here usAIRco's Refrigerated Kooler-aire RK-25B, 25 h.p. capacity, proved the ideal choice because it combines all the elements of a built-up system into one compact unit, saving on initial cost, installation, floor space and maintenance. The RK is delivered ready for immediate installation and only 3 connections are necessary: to ducts, water supply and drain, and power supply. For maximum economy of operation, the RK's evaporative condenser continually recirculates water, saving 95% of water consumption.

By installing the RK in the back room of the Shopwell Super Market, no valuable selling space was consumed. Cort Mechanical Corporation was the contractor. Architect: Sidney Schenker, Paterson, N. J., Builders: Kessler & Pirozzi, Jamaica, N. Y.

Manufactured in 10 different sizes (from 3 to 50 h.p.) there is an RK model in single or double refrigerant circuit arrangements, to meet any air conditioning requirement.

For Descriptive Literature on RK's Write Dept. HP 553

UNITED STATES AIR CONDITIONING CORPORATION

MINNEAPOLIS 14, MINNESOTA

usAIRco

Bush heating installation...*a pipe*"

Bush FINNED pipe, that is! . . . at new Remington Rand Building in Hartford, Conn.

Contractors praise Bush finned pipe . . . say it's easiest to install of any type of finned radiation. Expansion hangers are the answer.

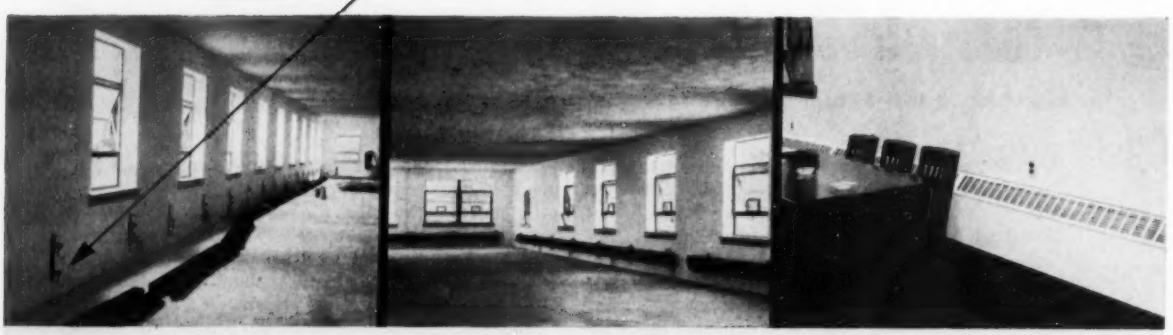
Bush expansion hangers . . . simple, efficient, practical. Attached to the wall with 2 bolts, these adjustable pipe hangers provide for a full 3" of horizontal expansion as well as 2" of pitching. Moreover, the complete assembly is designed to serve as support for the cover.

At Remington Rand's new office building in Hartford, the heat load for the 72' x 128' two story building is handled by two boilers — each with a capacity of 4480 sq. ft. of radiation. Continuous flow control — actuated by an indoor-outdoor thermometer — regulates the water temperature.

Bush type W finned radiation (4" x 4" on 2" pipe) has been used throughout. Bush covers provide the finishing touch to a modern, easily installed commercial heating system.

Check with a Bush Engineer the next time you're on an institutional, commercial or industrial heating job . . . make your task a "pipe".

Write for free bulletins on Bush finned radiation and covers.



Architect: Frederick C. Teich; Hartford, Conn.
Contractor: Morris A. Norberg Co.; Hartford, Conn.
Engineers: Hurley and Capocefalo; Winstead, Conn.

BUSH MANUFACTURING COMPANY
WEST HARTFORD 10, CONNECTICUT

Heating Piping & Air Conditioning

Vol. 25 No. 5

MAY 1953

(with which is merged the Aerologist)

DESIGN, INSTALLATION, OPERATION AND MAINTENANCE IN INDUSTRIAL, COMMERCIAL, INSTITUTIONAL AND PUBLIC BUILDINGS

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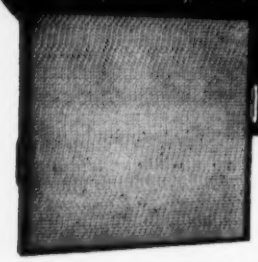
BANISH HIGH AIR FILTRATION COSTS!

FAR-AIR* Filters Save You Money Four Ways!



Yes, you can have more efficient air filtration at less cost when you install FAR-AIR. These are the original high velocity filters and are "lifetime engineered" for economy and top efficiency. Remember these four ways to save the next time you buy or replace air filters:

Other FAR-AIR Products:

Self-Washing Filters
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Engine and Compressor Filters
Rotary (Evaporative) Coolers
Air Baffle Equipment
Filter Servicing Equipment

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FARR COMPANY
P. O. Box 10187, Airport Station, Los Angeles 45, California

Gentlemen: I would like full information on FAR-AIR filters.
I would_____ would not_____ like a Farr Field Engineer to call.

1+1=3

LOWER FIRST COST

FAR-AIR filters handle 50% more air per unit with less pressure loss than ordinary types. Thus two filters will do the work of three which means fewer units to buy originally plus the economy of smaller plenum chambers. Each FAR-AIR filter will handle *more* dirt and *more* air with *less* pressure loss and will give greater efficiency than other types of impingement filters.

60%

LESS MAINTENANCE

Because there are fewer filters required to do your job and because of the exclusive herringbone-crimp media design which allows each filter to hold more dirt, cleaning frequency is drastically reduced—over 50%! Maintenance is faster and easier, too, because of the free flushing characteristics of the media—a great saving in time and money.

GREATER EFFICIENCY

The exclusive herringbone-crimp design of FAR-AIR filters allows the dirt to load progressively through the entire filter, not just on the face. There is exceptionally low pressure loss even on a fully loaded filter because channels in the media allow passage of clean air. This gives you more efficient filtering under all dust conditions for longer periods of time.

LONGER

SERVICE LIFE

Excellence of construction protects your investment and insures that FAR-AIR filters will far outlast ordinary types. Here are some of the quality features.

Sixteen gage steel filter and holding frames assure well-aligned rigid filter banks. Reinforcing rods make distortion virtually impossible. Felt linings prevent air by-pass. Firmly packed media provides *permanent* even density and assures uniformly high efficiency over the entire filter area.

Truly, when you buy FAR-AIR filters you get more for your money *four* ways. It will pay you to investigate these filters now and cut your air filtration costs.

FAR-AIR FILTERS
"Better by Farr"

*Trade Mark

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Manufacturing Engineers
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FOR COOLING TOWERS WITH

Guaranteed Performance...

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There's a Pritchard Cooling Tower for every air conditioning application. From ready-to-ship packaged towers to the largest custom built units, Pritchard guarantees to deliver maximum rated performance.

Highest quality materials, finest craftsmanship, and twenty-eight years of cooling tower know-how combine to make Pritchard your first choice in air conditioning cooling towers. And remember, when you specify Pritchard you specify satisfaction that's **guaranteed.**

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Mechanical draft towers especially suited to air conditioning requirements. Sizes range from 100 to 1500 tons capacity. Deck filled vertical counterflow design for efficient, long-time service. Available in all-Redwood, Redwood frame with steel or cement asbestos board sheathing. On your next air conditioning job specify a Pritchard Series "Q" Cooling Tower for either roof or ground level installation.

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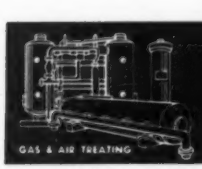

Producers of QUALITY Specialized Process EQUIPMENT

J.F. Pritchard & Co.

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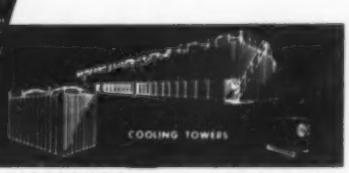

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minimum parts

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factory pre-assembled, ready to use

LEAKLESS—
phosphor deoxidized copper bellows replaces packing, prevents leaks

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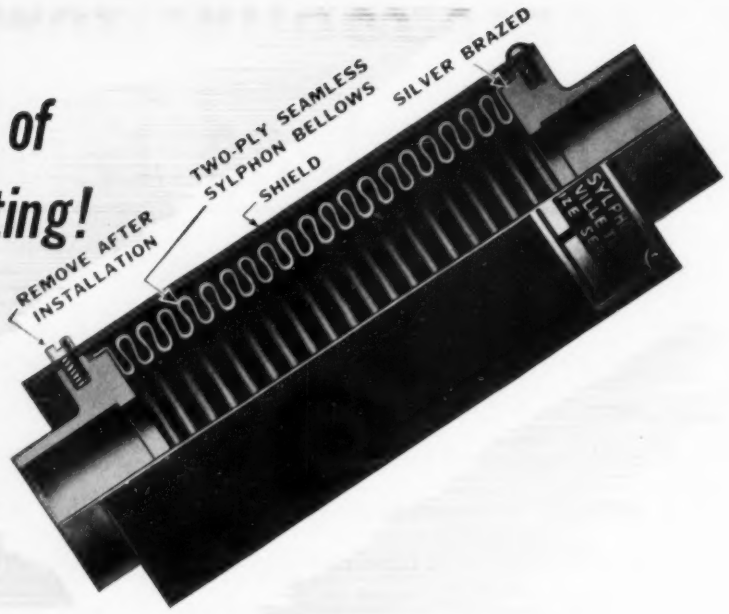
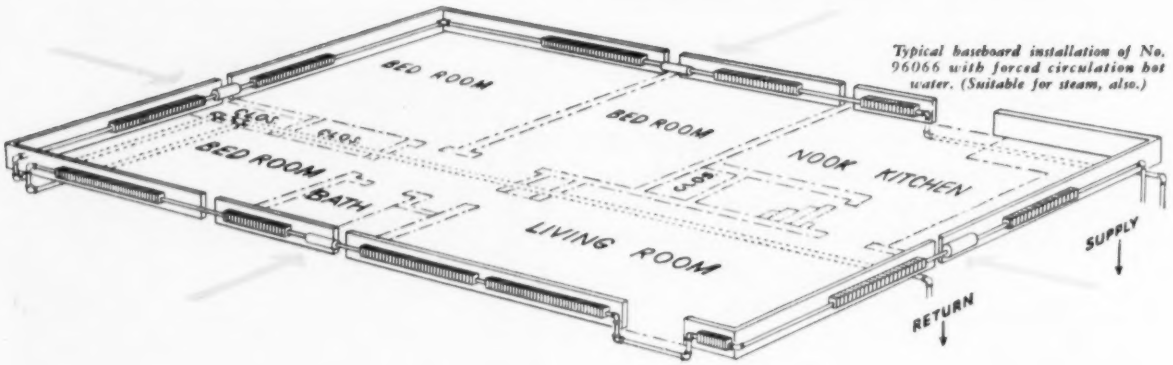


New SYLPHON Packless Expansion Joint No. 96066



Typical baseboard installation of No. 96066 with forced circulation hot water. (Suitable for steam, also.)

THIS NEW Sylphon Packless Expansion Joint, No. 96066, provides a simple means for absorbing expansion of "baseboard" radiation, finned tube convectors, horizontal supply lines, etc. It is ideal for both hot water and steam heating lines.

Pre-assembled at the factory, Sylphon Packless Expansion Joint No. 96066 is easy to install — horizontally or vertically. It can also be removed easily from the line. Sturdily built of corrosion-resistant materials to assure long, trouble-free service. Write for bulletin that gives full details about sizes, pressure limits, etc. Ask for Catalog JH-E.

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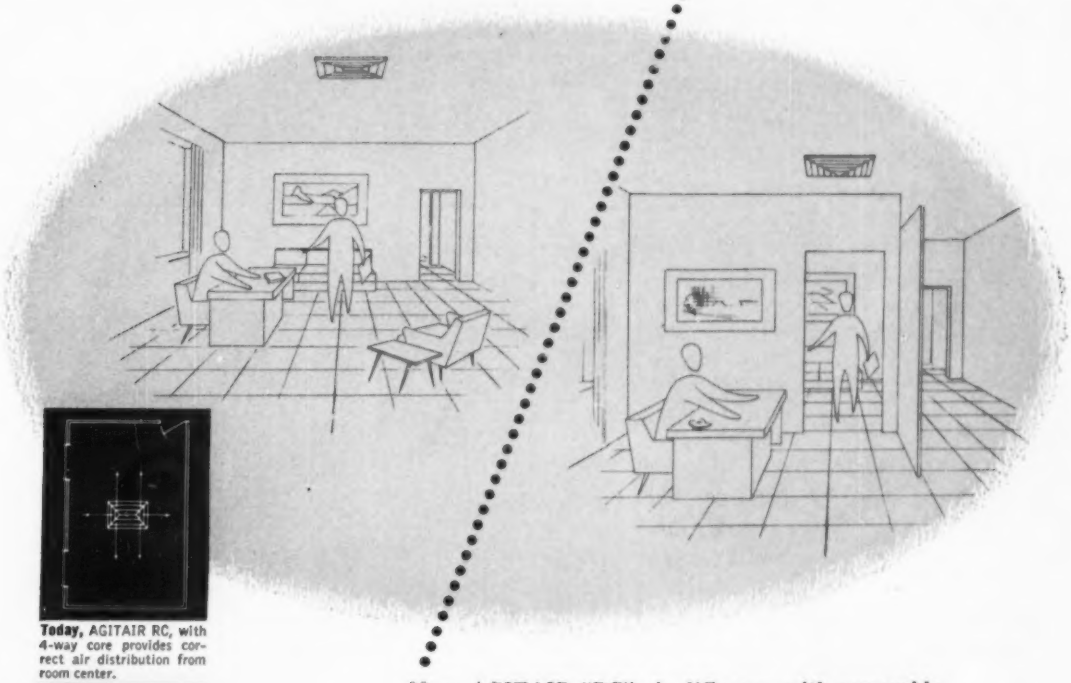
How to be years ahead...over head



Today, AGITAIR RC, with 4-way core provides correct air distribution from room center.

Tomorrow, with walls moved and partitions added, a 3-way AGITAIR core assures correct air distribution from side of room.

Now, AGITAIR "RC" air diffusers—with removable, interchangeable cores—enable you to plan for today and be prepared for tomorrow. Mounting frames are permanent, attractive . . . come in three distinct styles to meet all job conditions. Exclusive AGITAIR features include patented, built-in diffusing vanes and unlimited pattern possibilities . . . giving 100% control of volume and direction of discharge in areas of any size or shape. Installation is quick, simple. Merely attach mounting frame to duct. Then insert diffuser core and lock into position. Whether you are an architect, engineer or contractor, you will want the latest technical data on the new AGITAIR "RC" diffuser. Contact your local AGITAIR representative, or write us today.

The vanes make the difference

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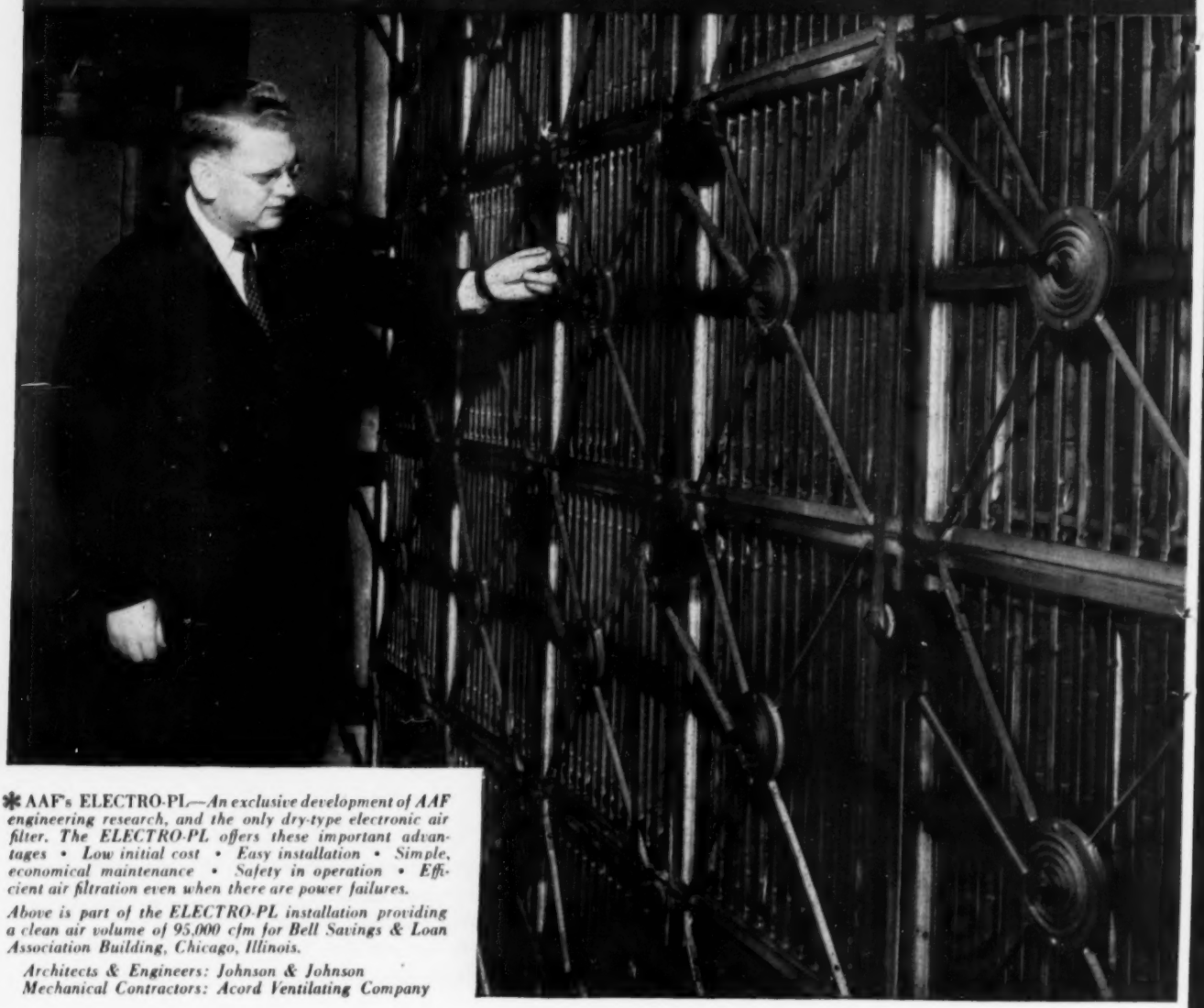
AIR DIFFUSERS • FILTERS • EXHAUSTERS

TYPE RC . . .
For Standard Installations

TYPE RCDF . . .
For Drop Frame Installations

TYPE RCTC . . .
For Tile Ceilings

Why does AAF make

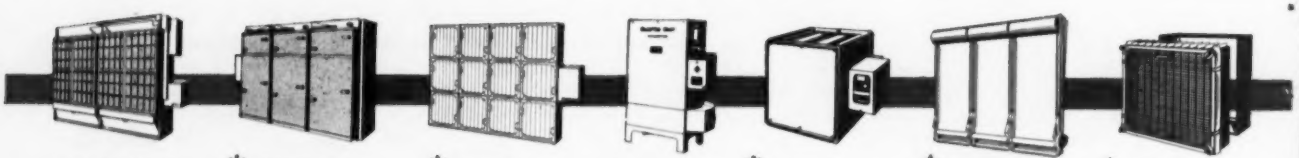


✻AAF's ELECTRO-PL—*An exclusive development of AAF engineering research, and the only dry-type electronic air filter. The ELECTRO-PL offers these important advantages • Low initial cost • Easy installation • Simple, economical maintenance • Safety in operation • Efficient air filtration even when there are power failures.*

Above is part of the ELECTRO-PL installation providing a clean air volume of 95,000 cfm for Bell Savings & Loan Association Building, Chicago, Illinois.

Architects & Engineers: Johnson & Johnson
Mechanical Contractors: Acord Ventilating Company

a single source for all air cleaning equipment . .



ELECTRO-MATIC ✻ELECTRO-CELL ✻ELECTRO-PL ELECTRO-MIST ✻ELECTRO-KLEAN ✻AUTO-AIRMAT ✻AIRMAT PL-24

8 dry-type* air filters?

THE answer is simple, but *important* to all Engineers and Executives responsible for air cleaning applications. AAF's eight different dry-type air filters were specially designed to meet the complex combination of factors that faces the engineer in solving dust and air contamination problems. Years of experimental work and thousands of individual installations have proved that at least six basic types are necessary to allow adequate latitude in specification, and to meet job requirements both practically and economically. Today, AAF's dry-type filters provide a wide range of operating and maintenance characteristics — from the AUTO-AIRMAT (fully automatic and self-cleaning) to simple replaceable units.

AAF's eight types of dry filters offer the engineer maximum flexibility in combining the following factors to fit specific job requirements:

- Cleaning Efficiency
- Maintenance Methods
- Space Requirements
- Sizes and Air Volumes
- Practical and Realistic Range of Costs

In addition to a complete line of air cleaning equipment AAF also offers the services of a nationwide engineering staff, which is recognized as the leading authority in this field. The specialized knowledge of these experts can save you time, effort and expense and is at your disposal.

Complete engineering data is available on all AAF equipment. Contact your nearest AAF representative or write direct to us.

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COMPANY, INC.

373 Central Avenue, Louisville 8, Ky.

AMERICAN AIR FILTER OF CANADA, LTD., MONTREAL, P. Q.

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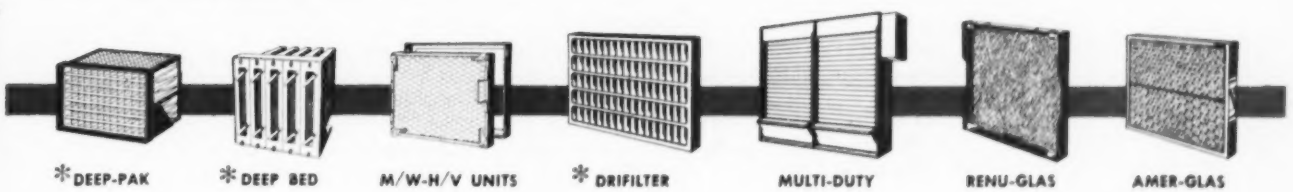
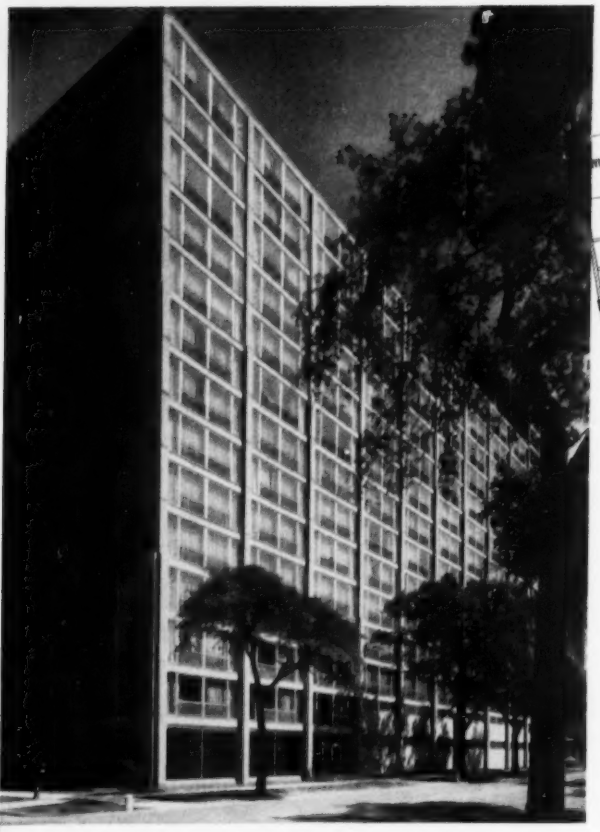


*DEEP-PAK | *DEEP BED | M/W-H/V UNITS | *DRIFILTER | MULTI-DUTY | RENU-GLAS | AMER-GLAS



TYPICAL FLOOR PLAN

Architects and engineers for Chicago's 2933 Sheridan Road Apartments were Pace Associates, Chicago. Management of the building is handled by Benjamin E. Sherman & Son, Chicago.

How Honeywell Customized Temperature Control can help you solve a real problem in every apartment building you design

Special system keeps all tenants comfortable all the time, cuts fuel costs

What can you do to keep tenants from opening windows (thus wasting costly heat) when they think their apartment's overheated? How do you answer a tenant's complaint that "It's too cold up here" when his apartment is far from the boiler? Or for that matter, just how do you satisfy the people who like it 76° and those who insist on 68°—in the same building?

Ever since the first apartment was built, owners and managers have been plagued by such questions. But they need no longer worry.

The way these problems are being met—by Honeywell Customized Temperature Control—in the 2933 Sheridan Road Apartments in Chicago shows why. This installation provides separate thermostats for every apartment—so tenants can select the temperature *they* want.

Here's what a couple of people intimately acquainted with the 2933 Sheridan Road Honeywell Customized Temperature Control installation have to say: *Tenant* Lee H. Kulp says, "Our rooms are always comfortably warm—but never hot or stuffy. My wife is delighted."

L. H. Sherman, *management associate*, says, "All our tenants find the system very satisfactory. As owners and agents we're especially pleased with the economical fuel consumption."

Thermostats indicated on the typical floor plan above are Honeywell's dependable T0400. They're connected to new Honeywell Midget Valves which regulate temperature of ceiling panels.

Other features of the Honeywell Customized Temperature Control installation include individual thermostats to control unit heaters in the garage area. A separate summer air cooling system for the corridors is controlled by Honeywell's sensitive L0900.

For comfortable, even temperature in new or existing buildings—of any size—use Honeywell Customized Temperature Control

Whether it's an apartment, church, school, office, factory, hospital, store, garage—or any size building—new or existing, Honeywell Customized Temperature Control can help meet your clients' heating, ventilating, air conditioning and industrial control problems.

Once equipped with Honeywell Customized Temperature Control, they'll have an ideal indoor "climate"—and save fuel besides.

And with a complete line of pneumatic, electric and electronic controls to choose from, Honeywell Customized Temperature Control offers you the greatest flexibility in design.

For full facts on Honeywell Customized Temperature Control, call your local Honeywell office. There are 104 across the nation. Or mail the coupon today.

One thermostat furnishes ideal comfort in smaller apartments. Tenants can regulate to comfort level *they* prefer, get compensating effects of individual thermostat against north winds or winter sun—depending on exposure of apartment.

Two thermostats in larger apartments such as this give tenants zoned comfort, save additional fuel for management. Manager normally turns back both thermostats when tenants leave for cold-weather vacations—thus saving considerable fuel.

MINNEAPOLIS
Honeywell

H HONEYWELL

First in Controls

MINNEAPOLIS-HONEYWELL REGULATOR CO.
Dept. HA-5-79, Minneapolis 8, Minnesota

Gentlemen:
I'm interested in learning more about Honeywell Customized Temperature Control.

Name .....

Firm Name .....

Address .....

City ..... *Zone* ..... *State* .....

You can put full confidence in them!

McQuay ...A GREAT NAME COAST-TO-COAST

in heating, air conditioning and refrigeration!

You're in good company when you specify McQuay's proved and preferred heating and air conditioning products. McQuay is proud of its good name in the industry—and fully prepared to back up its claim that the exclusive Ripple-Fin Coil construction of its products is positive assurance of high heat transfer efficiency . . . dependable performance . . . *customer satisfaction*. Link your good name with McQuay's through the McQuay representative in your territory . . . you can put full confidence in him when you are confronted with a problem, whether it's selling help, technical advice or quick action you need.

McQuay INC.

1601 Broadway N. E., Minneapolis 13, Minn.

HEATING

AIR CONDITIONING

REFRIGERATION

IN YOUR McQuay REPRESENTATIVE

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E. P. Murr,
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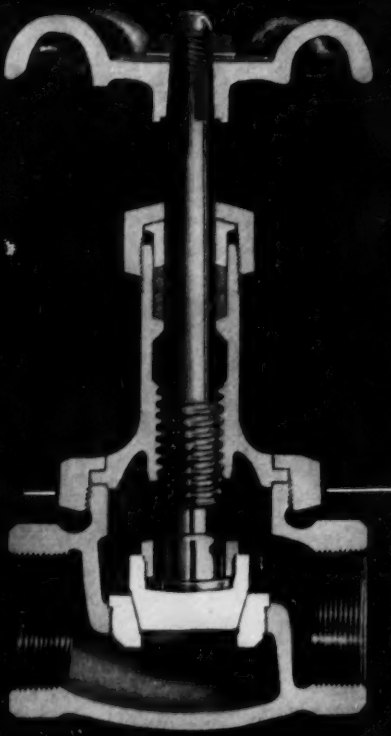


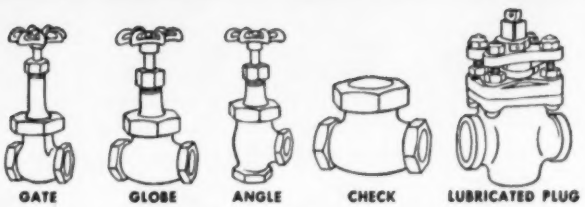
BRONZE

COMPLETE LINES OF BRONZE VALVES AND PIPE FITTINGS are manufactured by Walworth in a variety of types, pressure ratings, sizes, and patterns, including Walseal® Bronze Valves and Fittings for making Silbraz® joints.

Walworth also manufactures complete lines of valves and fittings — including Lubricated Plug Valves — made of steel, iron, and special alloys as well as bronze.

Walworth-made valves, pipe fittings, and pipe wrenches, total approximately 50,000 items—all sold through distributors in principal centers throughout the world.

Walworth engineers will be glad to help you with your problems. For full information call your local Walworth distributor, nearest Walworth sales office, or write to Walworth Company, General Offices, 60 East 42nd Street, New York 17, N. Y.



Bronze valves in gate, globe, angle, check, and lubricated plug types are manufactured by Walworth. Illustrated is a sectional view of a Walworth No. 225P Bronze Globe Valve. This valve has a working steam pressure rating of 350 psi at 550F (1,000 psi non-shock cold water, oil, and gas pressure). It features a renewable, plug type, stainless steel seat and disc, heat treated to 500 Brinell hardness.

WALWORTH

Manufacturers since 1842

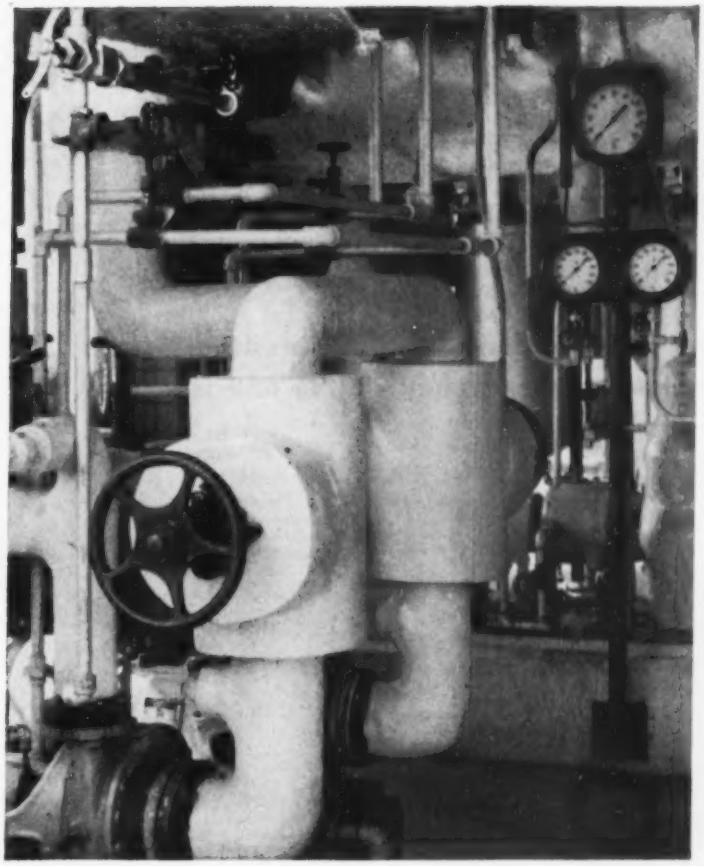
valves . . . pipe fittings . . . pipe wrenches

60 East 42nd Street, New York 17, N. Y.

DISTRIBUTORS IN PRINCIPAL CENTERS THROUGHOUT THE WORLD

Users say that Swift's Lagging Adhesive

SAVES TIME with a FAST SET



Swift's Lagging Adhesive helps you speed up your entire insulation operation because it sets faster and dries to a strong, continuous film. No waiting for the right humidity. Swift's Lagging Adhesive works efficiently under both dry and damp conditions. Here's why you can count on Swift's Lagging Adhesive to do your job more efficiently:

Safe! Does not support combustion . . . a synthetic resin emulsion, it's free of inflammable solvents and contains fire retardants.

Moisture-resistant . . . protects insulations against sogginess.

Mold-resistant . . . protects against mold and vermin attack.

Saves paint . . . an excellent undercoating for paint, it prevents penetration into lagging cloth . . . helps you go farther with less paint.

Easy to use . . . brushes on easily and quickly without dragging. Can be diluted with water if desired.

Tops as a cement and size in applying modern insulations

Call **SWIFT** first for **ADHESIVES**

This offer expires June 30, 1953

Swift & Company
Adhesive Products Department
Chicago 9, Illinois

Please send me your _____ gallon introductory trial shipment of Swift's Lagging Adhesive at the quantity price, to be tested for use in our operations. We understand, if not fully satisfactory, it may be returned for credit at your expense.

Name _____

Firm Name _____

Address _____

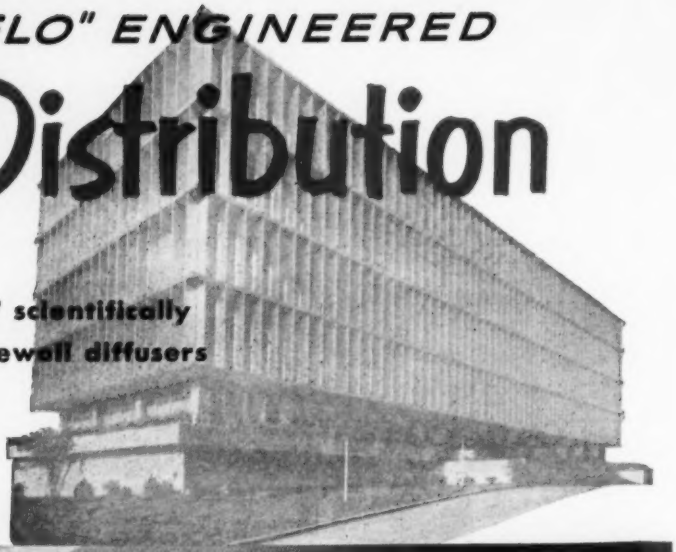
City _____ *Zone* _____ *State* _____

BARBER COLMAN

"UNI-FLO" ENGINEERED

Air Distribution

New Pan-American building "breathes" scientifically through Barber-Colman ceiling and sidewall diffusers



Architects: Skidmore, Owings and Merrill. Associate architect: Claude E. Hooton. Consulting engineers: Cary B. Gamble & Associates. General contractor: George T. Glover Co. Mechanical contractor: Emile M. Bast Co. Sheet metal contractor: Sidney N. Prats.

***"Uni-flo" square ceiling diffusers** are used throughout the building, some between light troffers, others replacing acoustical ceiling sections. Due to Barber-Colman's unique deflection control disc on supply units, adjustments from vertical to horizontal discharge are made easily without change in appearance.*

***Recessed** units are inconspicuous, harmonize architecturally.*

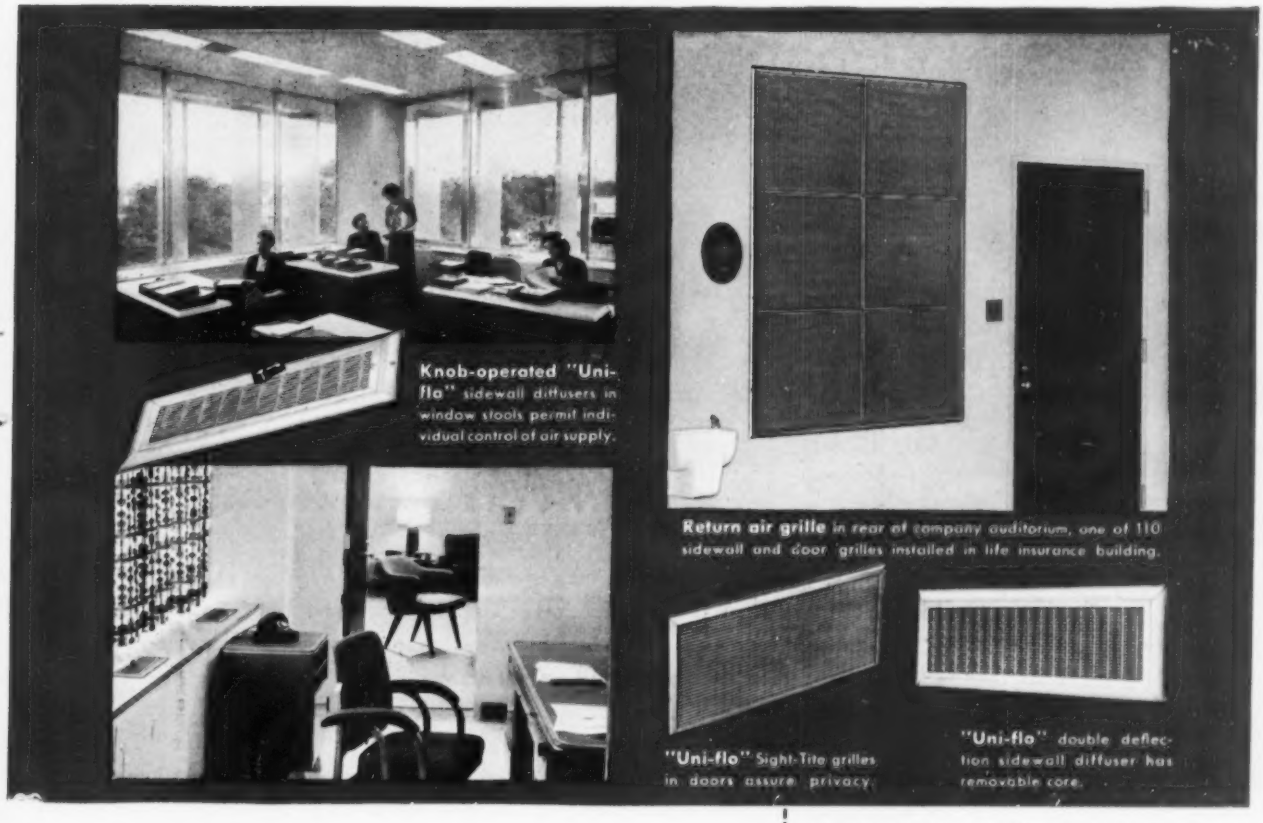
Air distribution, skilfully engineered to meet climate and occupancy requirements, is a noteworthy feature of the new Pan-American Life Insurance Co. building in New Orleans.

Some of the 604 "Uni-flo" square ceiling diffusers are used for return air. The remainder of these diffusers are used to supply air uniformly, quietly, efficiently. Each of the latter is equipped with an exclusive deflection control disc which permits utmost flexibility in establishing air patterns from horizontal to vertical, after installation. Uncomfortable drafts, corner smudges are eliminated.

Counteracting solar heat through the vast glass expanses, and permitting occupants individual control over air supply to offices, is the function of 524 knob-operated, sidewall type "Uni-flo" diffusers in the window stools. Sponge rubber gasketed to prevent leaks, with a removable core for cleaning purposes, these double deflection diffusers are of attractive design, rugged in construction, and engineered for maximum adjustment within a safe range.

An additional 90 "Uni-flo" side wall diffusers were specified for auditorium, print shop, paper storage, and engine room areas. Some 20 door grilles for air return completed the project.

For data on Barber-Colman's complete line of expertly engineered grilles, registers and diffusers, phone your nearby field office, or send coupon below.



Knob-operated "Uni-flo" sidewall diffusers in window stools permit individual control of air supply.

Return air grille in rear of company auditorium, one of 110 sidewall and door grilles installed in life insurance building.

"Uni-flo" Sight-Tite grilles in doors assure privacy.

"Uni-flo" double deflection sidewall diffuser has removable core.

BARBER COLMAN

"UNI-FLO" ENGINEERED

Air Distribution

Air Distribution Products • OVERdoors & Operators • Automatic Controls
Aircraft Controls • Industrial Instruments • Small Motors • Molded Products • Metal Cutting Tools • Machine Tools • Textile Machinery

BARBER-COLMAN COMPANY, ROCKFORD, ILL., U. S. A.
Dept. F, 1101 Rock St. • Field offices in principal cities

☐ Please send new data bulletin on engineered air distribution equipment, F. 4471-1

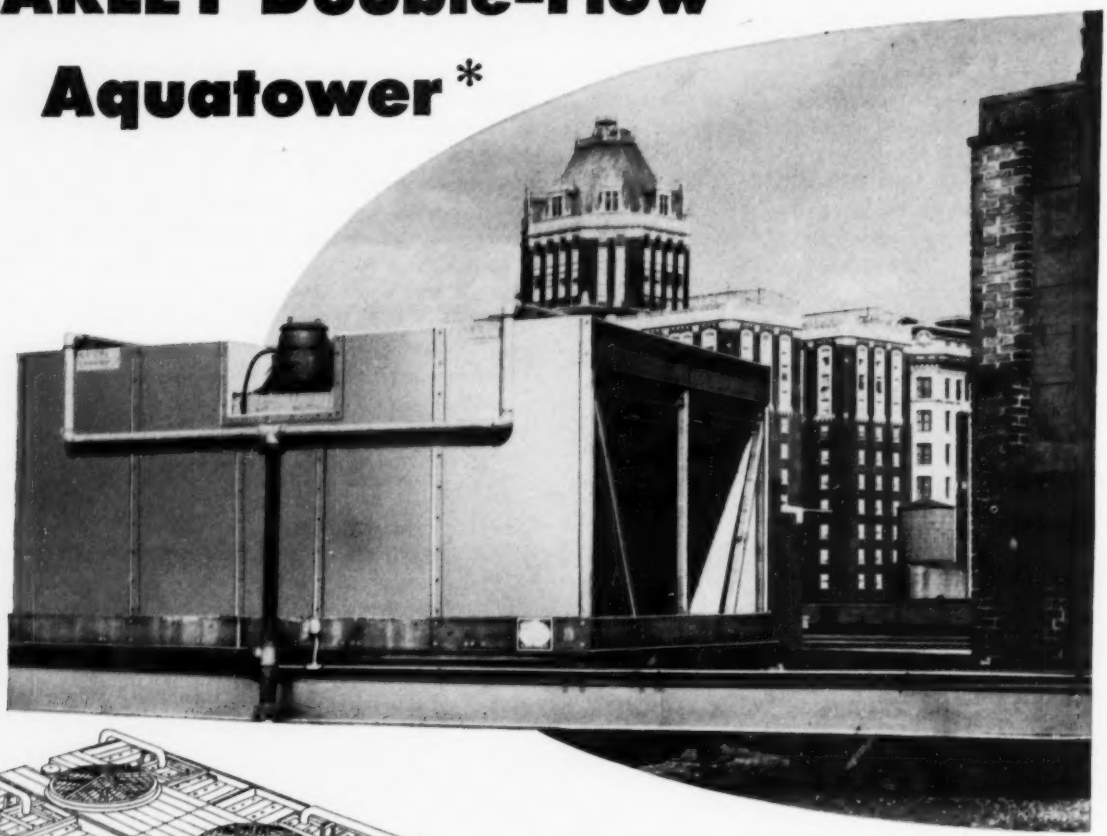
Name_____

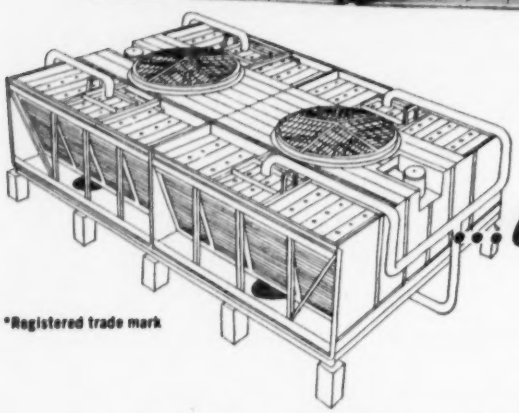
Firm Name_____

Address_____

City_____ State_____

MARLEY Double-Flow Aquatower*





*Registered trade mark

... a cooling method as modern as tomorrow

Old-time concepts of intermediate-capacity cooling have been completely changed since the introduction of the Marley Double-Flow Aquatower. Here, for the first time, is a unit that combines big-tower efficiency with small-tower simplicity and compactness. Big-tower features include excellent weight distribution . . . one fan that draws air from two completely open sides . . . open distribution . . . ready accessibility for inspection and maintenance. Yet, with all these advantages, the Double-Flow Aquatower reduces usual tower height by one-third, and retains all the simplicity of installation and operation found in Marley's smaller Aquatowers.

The Double-Flow Aquatower is available in a wide range of standard sizes, in all-steel or redwood with asbestos cement board casing. Lowest in silhouette and pumping head, highest in efficiency, it is Marley's answer to the demand for a modern cooling method on jobs requiring 50 tons or more of refrigeration.

MARLEY

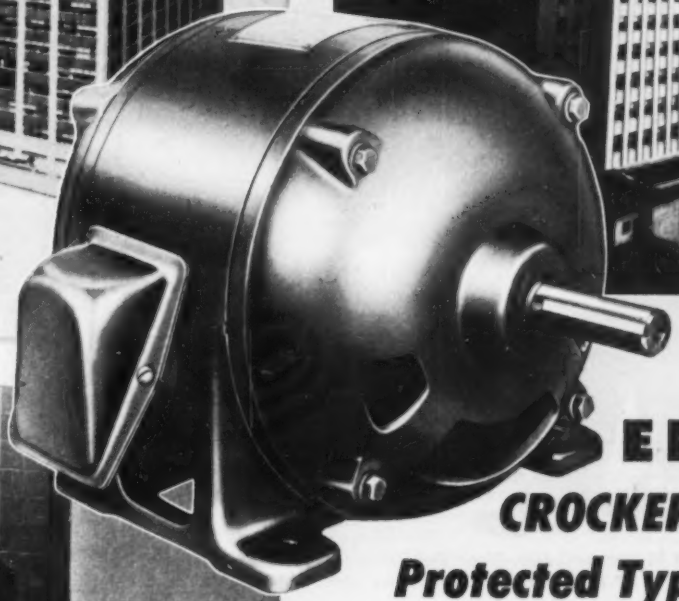
The Marley Company

Kansas City, Missouri

AS GOOD AS THE BUILDINGS THEY SERVE!

AT 100 PARK AVENUE, NEW YORK, 60 of these motors insure dependable air conditioning.

THE NEW 525 WILLIAM PENN PLACE BUILDING, PITTSBURGH, has 95 Elliott Crocker-Wheeler motors to serve its "two-zone" air conditioning system.



In Macy's big modernized Kansas City store, Elliott Crocker-Wheeler motors drive the freon compressors in the air conditioning system.

ELLIOTT CROCKER-WHEELER Protected Type MOTORS

● You'll see them in many fine modern buildings, always in positions of trust, where the success of functions vital to comfort and liveability depends upon their reliable operation. They drive the various pumps, fans, blowers and compressors that temper frigid blasts or torrid heat to uniform indoor ease, summer and winter. They are motors which will guard the reputation of a heating contractor, builder or architect as safely as they guard comfort in the buildings they serve.

In NEMA frames 203-505 inclusive and larger. Vertical, NEMA C Face or D Flange mountings. All standard voltages and frequencies. Also available with brake. Write for Bulletin 6000-1.

ELLIOTT Company

CROCKER-WHEELER DIVISION

AMPERE, N. J.

For larger motors: RIDGWAY DIV., RIDGWAY, PA.

PLANTS AT: JEANNETTE, PA. • RIDGWAY, PA. AMPERE, N. J. • SPRINGFIELD, O. • NEWARK, N. J.

BRANCH OFFICES & REPRESENTATIVES IN PRINCIPAL CITIES

ELLIOTT *Approved* SERVICE SHOPS COVER THE COUNTRY

W2-17.

Now Trane offers you air up to 20 tons in one

Everything in one package. *New* TRANE *units can have water-cooled condenser . . . or water-saving evaporative condenser as shown here.*

3, 5, 7½-TON CAPACITIES These compact units are available in handsome upright cabinets for installation within conditioned areas.

10, 15, 20-TON CAPACITIES Larger horizontal units with removable panels are designed for installation near the conditioned area.

OPTIONAL EVAPORATIVE CONDENSERS 10, 15 and 20-ton units can have evaporative condenser which slashes water consumption up to 98%.

Perhaps these new TRANE Self-Contained units can provide the packaged answer to air conditioning requirements on your next job. For full information call or see your nearest TRANE sales engineer.

TRANE

MANUFACTURING ENGINEERS OF HEATING, VENTILATING AND AIR CONDITIONING EQUIPMENT

conditioning systems easy-to-install package!

3 to 20-ton Trane units arrive assembled, refrigerant-charged and ready to run . . .

Easy to install. Dependable. Quiet. Compact. Here's the answer to air conditioning requirements of offices, restaurants, super markets, shops, stores and dozens of places needing from 3 to 20-tons of cooling. And the installation can be made in a small space without disrupting business . . . without the necessity of selecting and installing separate component parts . . . without on-the-job refrigerant work. It's all done for you *at the factory* in these packaged TRANE Self-Contained Air Conditioners. A heating contractor can install them easily by making simple electrical and piping connections.

LOOK AT THESE 6 PACKAGED ADVANTAGES

No refrigeration work required—Units are completely wired, piped, dehydrated, charged and tested at the factory to meet specific operating conditions. Refrigerant line connections are welded for permanent leak-proof protection.

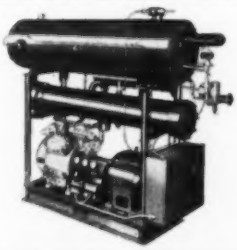
Only simple connections needed—Units arrive ready to run as soon as simple electrical and water piping connections are made. Ductwork is easily attached to flanged openings when required.

Provide complete air conditioning—These all-in-one-package units can cool, filter, dehumidify and circulate the air. They can be equipped with humidifiers, heating coils and dampers as required.

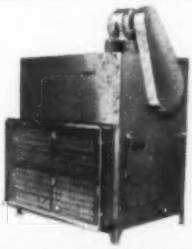
Fit into less space—You get real savings in space and weight. 20-ton capacity unit fits into floor space smaller than 3½′ x 6′.

Smooth, quiet performance is assured by perfectly balanced compressors and fans, rubber mountings and sound-muffling glass fiber insulation.

Undivided responsibility—Assembled in a single cabinet, the reciprocating compressor, condenser, fans and cooling coils are engineered and exactly matched for use together. You get the undivided responsibility of a *single* experienced manufacturer for the *entire* system.



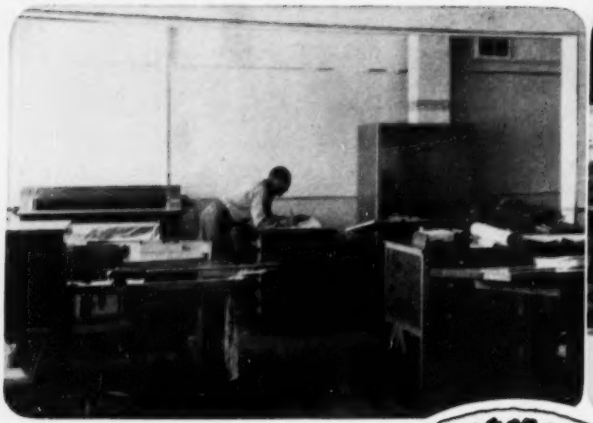
TRANE COLD-GENERATORS Complete, assembled water chillers for comfort or process systems. Factory engineered, wired, piped, refrigerant-charged. Require only simple plumbing and electrical connections. 6 sizes from 10 h.p. up.



TRANE CLIMATE CHANGERS Year-round air conditioners that heat, cool, humidify, dehumidify, filter and circulate air. Can do all or any combination of these jobs for comfort or process work. Capacities from 450 to 22,000 cfm.

brings you air conditioning...in a package

The Trane Company, La Crosse, Wisconsin • Eastern Manufacturing Division, Scranton, Pennsylvania • Trane Company of Canada, Limited, Toronto • 87 U.S. and 14 Canadian Offices



Showing 5-Hp. Conditioner, with ducts, installed in a drafting room at Salt Lake City

Chandler's Restaurant and Bar in New York, with seats for 250, are cooled with a Frick Conditioner

TRADE FRICK MARK®

Unit Air Conditioners

Have built into them 70 years' refrigerating experience: no better units are made today. Preferred by commercial establishments everywhere; backed by a world-wide organization. Get details about these superior conditioners now: there's a size to suit your needs. Ask for Bulletin 522. Some desirable territories still open for Distributors.

Frick Unit Conditioners are Built in 3, 5 and 7½ Hp. Sizes

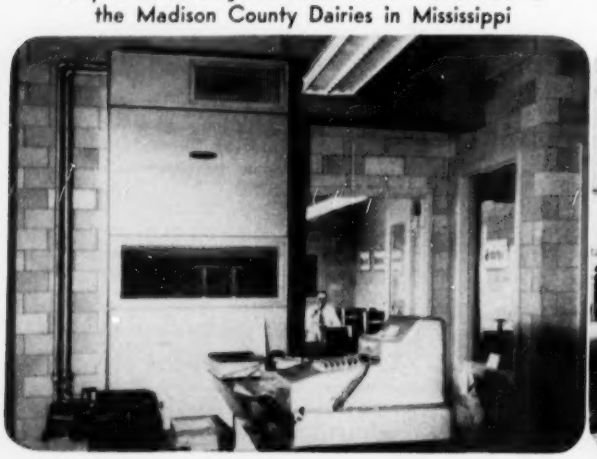
DEPENDABLE REFRIGERATION SINCE 1882

FRICK CO.

WAYNESBORO, PENNA. U.S.A.

Also Builders of Power Farming and Sawmill Machinery

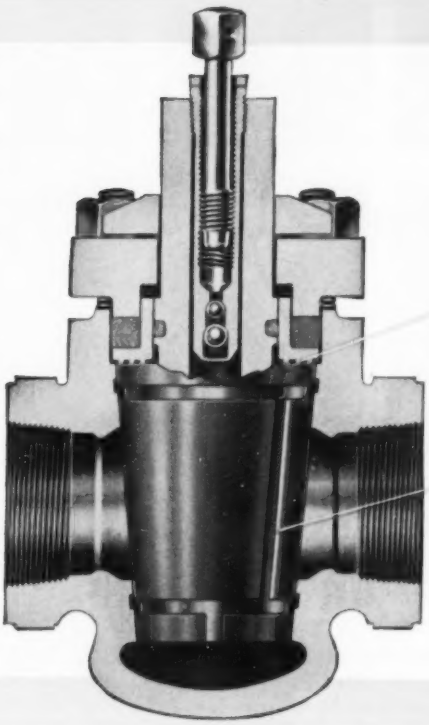
5-Hp. Unit cooling the office and ice cream bar of the Madison County Dairies in Mississippi



Stores, beauty shops, offices and industrial plants find Frick Unit Conditioners indispensable

Oh, I see

OIC now offers a complete line of Lubricated Plug Valves . . .



with two added features

1 Triple seal gives more effective sealing at shank with ease of turning.

2 Lubricant grooves that are never exposed to the flowing liquid.

OIC Tapered Lubricated Plug Valves assure positive, leakproof control of flow . . .

O-Ring . . . under initial compression, gives extra protection against leakage past shank.

Resilient Packing . . . completely enclosed in nonrotating metal parts, tends to seat the plug tightly in body without excessive cover tightness.

Labyrinth Seal . . . series of concentric rings on gland collar make firm contact between collar and top of plug face, providing additional seal.

2 Vertical Lube Grooves . . . 180° apart. When plug is given quarter turn, neither of these grooves is exposed to liquid flow.

Lubricant Chamber . . . under pressure from screw piston, lubricant creates upward force during lubrication, tending to free plug for easy turning.

Plug Lapped to Body . . . to assure perfect, leakproof fit.

Order in semisteel or steel . . . from your local OIC Distributor. Write for literature describing the advantages of OIC Lubricated Plug Valves.

OIC FOUNDED 1883

THE OHIO INJECTOR COMPANY • WADSWORTH, OHIO

VALVES | **FORGED & CAST STEEL, IRON & BRONZE, LUBRICATED PLUG VALVES**

TEAM SERVICE by U·S·Steel Supply speeds delivery!

WAREHOUSE SUPT.

TELEPHONE SALESMAN

INVENTORY ANALYST

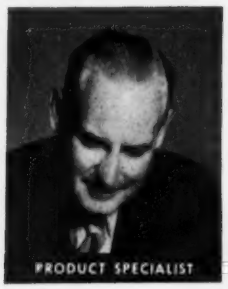
SALESMAN

DISTRICT MANAGER

RECEPTIONIST

OFFICE MANAGER

CREDIT MANAGER


PRODUCT SPECIALIST

WAREHOUSEMAN

ASS'T. DIST. MANAGER

TRAFFIC MANAGER

our "speed specialist" keeps your order on the move!

• As soon as your order is ready, our traffic manager gets it out of our warehouse and into your plant as fast as possible. If you specify delivery or routing instructions, he will see that they are followed exactly. If you leave the routing up to him, he will schedule delivery so as to give you the best possible protection in the matters of both cost and service.

When your order needs special handling, you can get the *personal* attention of our traffic manager through your U. S. Steel Supply salesman.

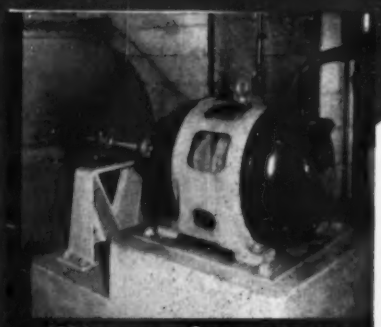
U.S. STEEL SUPPLY

DIVISION

General Office:
208 So. La Salle St.,
Chicago 4, Ill.

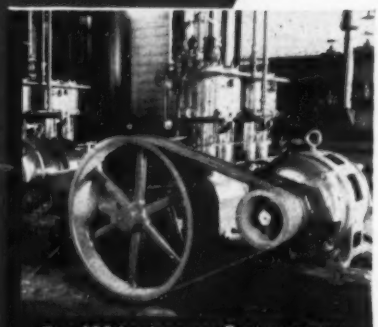
Warehouses and Offices
Coast to Coast

UNITED STATES STEEL



100 horsepower Century motor on a glass blowing machine.

WHY Century MOTORIZED EQUIPMENT KEEPS YOUR CUSTOMERS *SATISFIED...*



Two 100 horsepower Century motors driving refrigeration compressors.

The motor specifications—where skillfully selected—to assure the TOP PERFORMANCE and DEPENDABLE QUIET SERVICE that is built into each class of equipment.

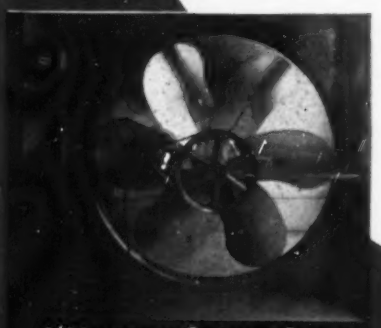
Refrigeration compressors require one combination of operating characteristics and specifications—fans and blowers another combination—various types of heating equipment still another.

In over 50 years, Century has developed a wide line of types of motors with literally hundreds of specifications to choose from. It is easy to ENGINEER YOUR PRODUCT PERFORMANCE—THROUGH SKILLFUL MOTOR APPLICATION.

If you have motor service problems, phone or write to any of Century's 28 District offices regarding Century's national network of service stations—the motor exchange plan will serve you whether your motors are in or out of warranty.

Century ½ horsepower capacitor motor on a furnace blower.

Specify Century Motorized Equipment—get top equipment performance—dependable quiet service—keep your customers satisfied.



1/6 horsepower Century motor on a ventilating fan.

CENTURY ELECTRIC COMPANY
1806 Pine Street • St. Louis 3, Missouri

Offices and Stock Points in Principal Cities

Century C MOTORS

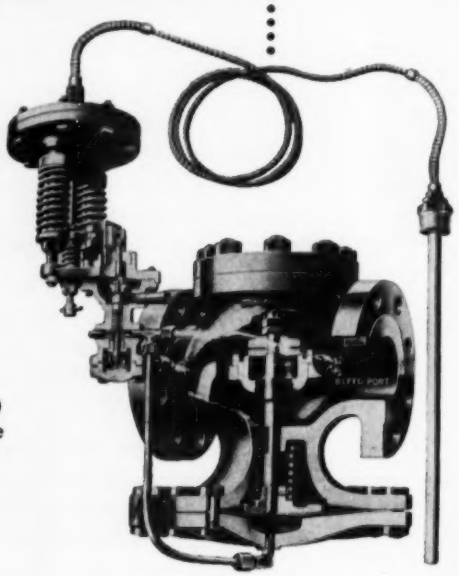
HOW SPENCE DESIGN...

...protects springs

FOR LONGER LIFE

In the Spence Regulator, the springs are out of the path of the steam or other fluid flowing through the valve. They operate at low unit stress for exceptionally long life. This is only one of the many Spence design features that assure dependable, accurate regulation year after year. That means less down-time, less time and money wasted on replacement of parts.

Spence makes a wide line of automatic regulating valves: Pressure, Temperature, Differential Pressure, Back Pressure, Pump Governor and many other types. Write for bulletin 100 giving full details.



Type ET150 Temperature Regulator

A few other design features:

SECO METAL SEATS AND DISCS— Durable SECO Metal resists wiredrawing. More than twenty years of experience in thousands of installations has failed to produce a single case where SECO Metal has been cut by steam.

LARGE BALANCED METAL DIAPHRAGM located in a cooled zone with a condensate seal above and below it, never has to be replaced under normal conditions.

PACKLESS CONSTRUCTION—All Spence main valves and most pilots are built without stuffing boxes. This minimizes friction . . . reduces valve stem wear and eliminates time-consuming maintenance.

Spence

SPENCE ENGINEERING COMPANY, INC.

WALDEN, NEW YORK

9K133

ULTRALITE

Duct Insulation and Duct Liner

...delivered when and where you need them, from on-the-spot stocks!

Something worth keeping in mind during the rush season for heating and air conditioning is this: *Stocks of Ultralite glass fiber insulation in 46 cities are as near as your phone!*

And you'll like working with Ultralite Duct Insulation and Duct Liner. These superb thermal and acoustical insulations have every characteristic that makes application easy and quick. They're light, flexible, resilient. You can cut them with a knife . . . run them quickly around curves and corners . . . adhere them to metal with adhesives, screws and washers, or wires.

Try Ultralite insulation, and you'll learn why it goes on faster, easier and cheaper than any insulation you've ever used! Call your local Ultralite distributor for friendly service and prompt delivery.

GUSTIN - BACON MFG. CO.

210 West 10th Street **Kansas City, Missouri**

ULTRALITE INSULATION

The textile type glass fiber insulation adaptable for most industrial insulation needs. Fire resistant - Rot proof - Vermin proof - Vibration proof - Corrosion resistant - low moisture absorption - Permanent

"WHERE TO BUY IT"

Your nearest distributor is listed in the yellow pages of the telephone directory in the following cities.

ALBUQUERQUE, New Mexico
ATLANTA, Georgia
AUBURN, Maine
AUGUSTA, Georgia
BALTIMORE, Maryland
BATON ROUGE, Louisiana
BEAUMONT, Texas
BILLINGS, Montana
BIRMINGHAM, Alabama
BOSTON, Massachusetts
BUFFALO, New York
BURLINGTON, Vermont
CHICAGO, Illinois
CINCINNATI, Ohio
CLEVELAND, Ohio
COLUMBUS, Ohio
DALLAS, Texas
DAVENPORT, Iowa
DENVER, Colorado
DETROIT, Michigan
EL PASO, Texas
FARGO, North Dakota
FORT WAYNE, Indiana
FORT WORTH, Texas
HOUSTON, Texas
INDIANAPOLIS, Indiana
JACKSONVILLE, Florida
KANSAS CITY, Missouri
JOPLIN, Missouri
LAFAYETTE, Louisiana
LEWISTON, Maine
LITTLE ROCK, Arkansas
LOS ANGELES, California
LOUISVILLE, Kentucky
LUBBOCK, Texas
MEMPHIS, Tennessee
MIAMI, Florida
MILWAUKEE, Wisconsin
MISSOULA, Montana
MOLINE, Illinois
NASHVILLE, Tennessee
NEWARK, New Jersey
NEW HAVEN, Connecticut
NEW ORLEANS, Louisiana
NEW YORK, New York
OKLAHOMA CITY, Oklahoma
OMAHA, Nebraska
ORLANDO, Florida
PHILADELPHIA, Pennsylvania
PITTSBURGH, Pennsylvania
PHOENIX, Arizona
PORT ARTHUR, Texas
RALEIGH, North Carolina
RICHMOND, Virginia
ROCK ISLAND, Illinois
SALT LAKE CITY, Utah
SAN ANTONIO, Texas
SAN FRANCISCO, California
SAVANNAH, Georgia
SEATTLE, Washington
SHREVEPORT, Louisiana
SPRINGFIELD, Missouri
ST. LOUIS, Missouri
ST. PAUL, Minnesota
SYRACUSE, New York
TAMPA, Florida
TRENTON, New Jersey
TULSA, Oklahoma
TUCSON, Arizona
WASHINGTON, D. C.
WICHITA, Kansas

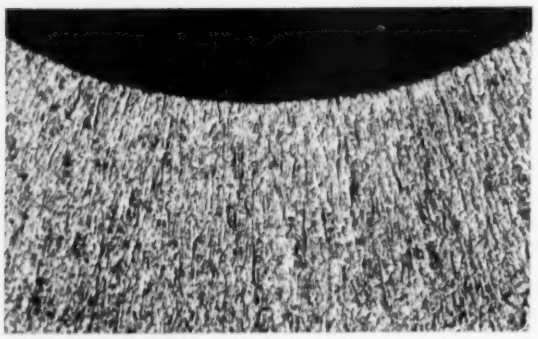
It is plug drawn

By being plug drawn, the tube is endowed with an inside surface of exceptional, mirror like smoothness. Thus the flow it provides is uniform, and uninterrupted, and high efficiency in operation is attained.

THIS DISTINCTIVE TUBE IS CALLED

Capilator*

the capillary tube used for restriction purposes



The accompanying photomicrograph, showing a 200-time magnification of the inside wall of the Capilator, gives you a good idea of the smoothness of this inside surface. The size of the tube shown was .081" O.D. x .031 I.D.

*REG. U. S. PAT. OFF.

When you attend the Inform-A-Show in Los Angeles May 24-27, be sure to visit our Booth 304

Other Wolverine Products

CAPILATOR*
—the capillary tube for restriction purposes
COMMERCIAL TUBE
AUTOMOTIVE TUBE
CONDENSER TUBE
COPPER WATER TUBE (K-L-M)
ELECTRIC WELDED STEEL TUBE
FABRICATED TUBULAR PARTS
WOLVERINE TRUFIN*
—the integral finned tube
REFRIGERATION AND AIR CONDITIONING TUBE (Plain or Tin Plated)
S.P.S. PIPE
SPUN-END TUBE†

*Reg. U.S. Pat. Off.
† A Patented Process RE 22465

It is to your great advantage to learn more about Capilator—indeed an exceptional capillary tube.

WOLVERINE TUBE DIVISION
of CALUMET & HECLA, INC.

ESTABLISHED 1918

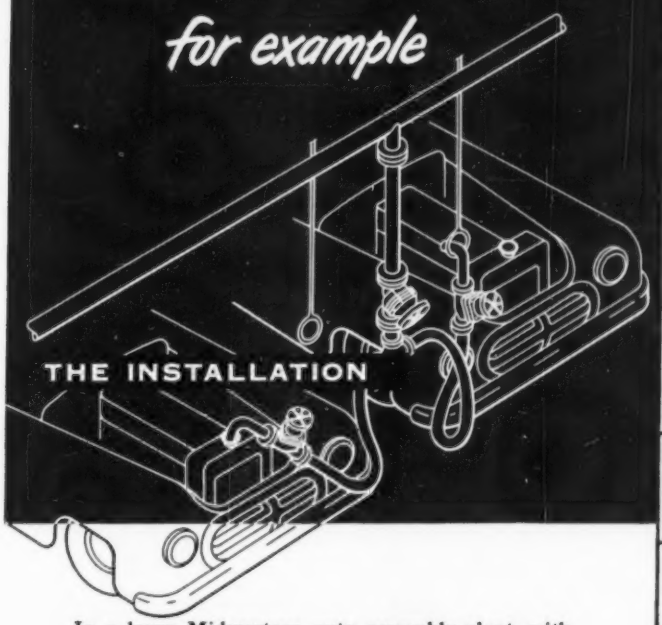
Manufacturers of Tubing Exclusively

1419 CENTRAL AVENUE • DETROIT 9, MICHIGAN

Plants in Detroit, Mich. & Decatur, Ala. *Sales offices in Principal Cities*

Export Department, 13 E. 40th St., New York 16, N. Y.

How Valve Life Changed from Days to Months ...on Crystalline Liquids, for example



In a large Midwestern auto assembly plant, with Crane Diaphragm valves in alcohol solution anti-freeze fill lines to automobile radiators.

VALVE SERVICE RATINGS

SUITABILITY:	Doing the job O.K.
FEATURES:	Packless; no leakage around stem
MAINTENANCE COST:	None
SERVICE LIFE:	Now 25 times longer than any valve used
OPERATING RESULTS:	Damage to production stopped
PRICE:	O.K. No premium
AVAILABILITY:	Regular Crane Catalog item. No. 1610

THE CASE HISTORY

None of the many conventional valves nor the plug cocks tried in this service lasted more than a week—about 2,000 operations.

The crystals present in anti-freeze would build up on seating surfaces and in the exposed valve stem threads. The valves leaked and were hard to operate. To the excessive maintenance needed was added the high cost of frequent damage to automobile finish by anti-freeze leakage.

Now Crane Packless Diaphragm valves control the trouble. Their sealed bonnet prevents contact of fluid and working parts; their seating design isn't hindered by crystal deposits. At last report, Crane valves have given over 50,000 trouble-free operations with no maintenance, and with indefinitely longer life assured.

THE VALVE

In Crane Diaphragm valves, the diaphragm serves only to seal the bonnet, not for seating. It isn't pinched or stressed when valve is closed. Independent disc gives control of fluid even should diaphragm fail. These valves are made in a wide variety of body, diaphragm, disc-insert, and body-lining materials to handle countless corrosive, abrasive, or ordinary services. See your Crane Catalog or local Crane Representative.

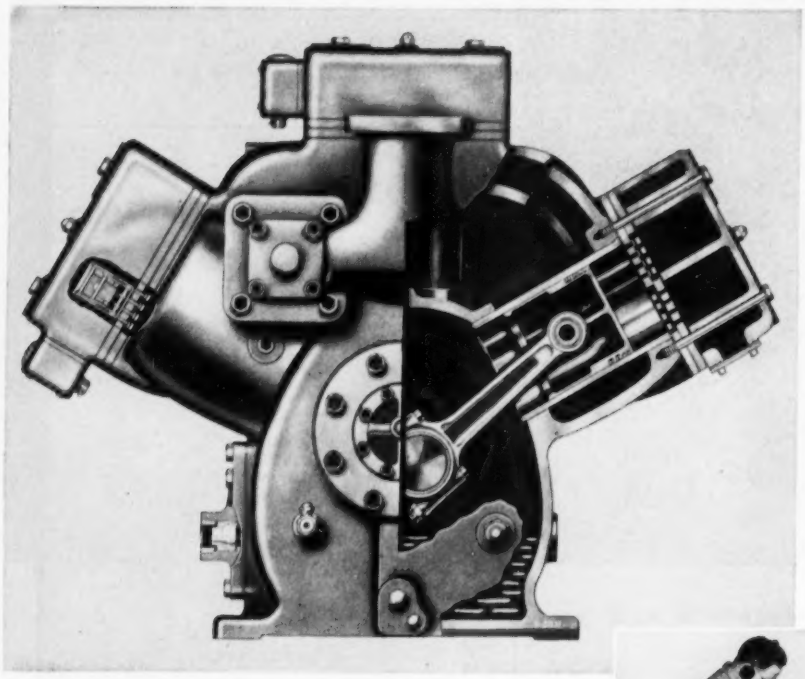
THE BETTER QUALITY...BIGGER VALUE LINE...IN BRASS, STEEL, IRON

CRANE VALVES

CRANE CO., *General Offices:* 836 S. Michigan Ave., Chicago 5, Illinois
Branches and Wholesalers Serving All Industrial Areas

VALVES • FITTINGS • PIPE • PLUMBING • HEATING

Optimum-speed Freon compressor has high capacity plus long life!



New Worthington unit combines advantages of low and high speed

CUTAWAY VIEW of the new Worthington "J" compressor—the product of years of engineering research. Maximum capacity, with no loss in operating efficiency, is yours with this lighter-weight, optimum speed machine.

The problem was to design a compressor that would combine the advantages of *low*- and *high*-speed operation. Worthington's answer: the new, *optimum*-speed "J" compressor—a compact, high-capacity machine with the same high operating efficiency and life expectancy as its lower speed predecessors.

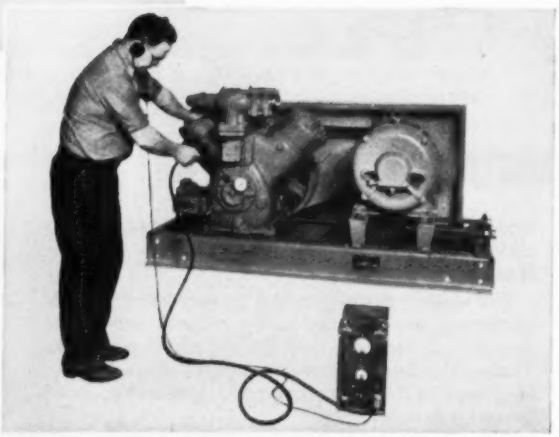
Here are just three of the many advancements in functional design that make the Worthington "J" line of compressors the finest available today.

1. ELECTRIC UNLOADING—a new achievement in variable capacity control. You can start compressor unloaded with a normal torque motor; power consumption is automatically balanced with load requirements. Separate unloader units in cylinder head allow easy maintenance . . . no complicated oil or gas pressure lines to worry about.

2. IMPROVED INTERNAL MANIFOLDING—cool suction gas completely surrounds the cylinder walls, providing longer valve life and increased overall efficiency. All passageways between suction discharge and shutoff valves are cast integrally within the crankcase, eliminating outboard fittings.

3. NEW FORCE-FEED LUBRICATION SYSTEM—full pressure, positive lubrication, regardless of rotation. A new rotary oil pump, driven directly by the crankshaft, eliminates complicated and noisy gear trains. Pump filters oil through a strainer in the crankcase.

Available in sizes of 3 to 150 tons, the new "J" compressors can be supplied with a horizontal shell and tube condenser, or they may be used with the Worthington Evaporative Condenser. Get in touch with your nearest Worthington district office, or write to Worthington Corporation, Air Conditioning and Refrigeration Division, Holyoke, Mass.



THIS ELECTRONIC LEAK DETECTION TEST is part of the rigid testing that every Worthington compressor goes through before leaving the factory. Pressure tests, underwater tests and vacuum tests make sure that every unit will give long, trouble-free service.

From the most complete line . . . comes the correct recommendation

WORTHINGTON

Air Conditioning and Refrigeration

A.3.3

where these

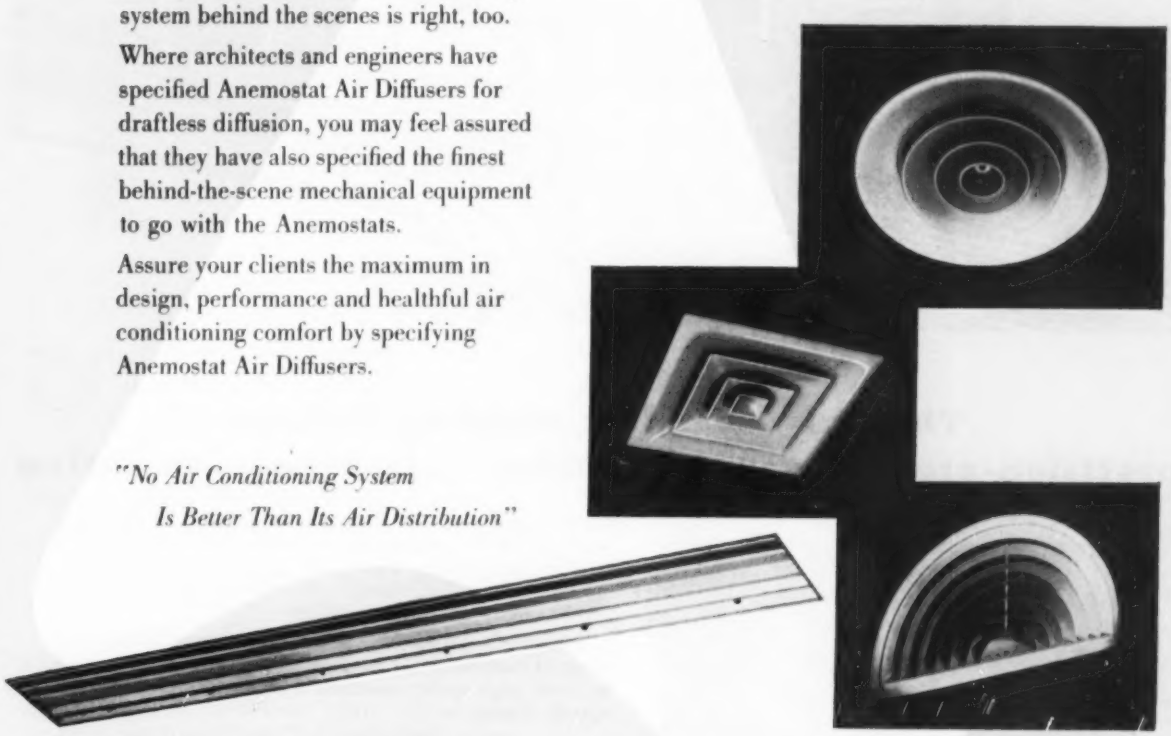
are in sight
the system is right

Wherever you see Anemostat Air Diffusers, it's a good bet that the air conditioning system behind the scenes is right, too.

Where architects and engineers have specified Anemostat Air Diffusers for draftless diffusion, you may feel assured that they have also specified the finest behind-the-scene mechanical equipment to go with the Anemostats.

Assure your clients the maximum in design, performance and healthful air conditioning comfort by specifying Anemostat Air Diffusers.

"No Air Conditioning System
Is Better Than Its Air Distribution"



ANEMOSTAT®

DRAFTLESS *Aspirating* **AIR DIFFUSERS**

ANEMOSTAT CORPORATION OF AMERICA

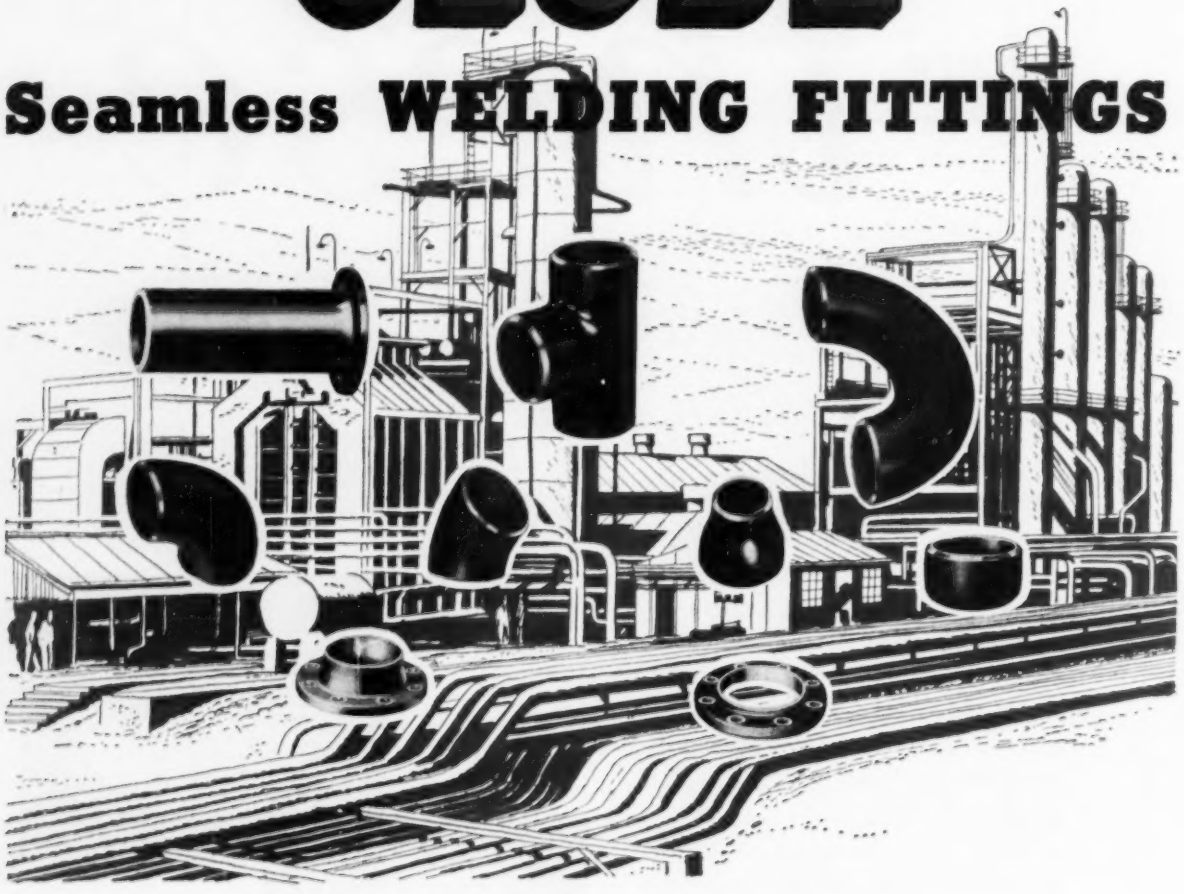
10 EAST 39th STREET, NEW YORK 16, N. Y.

REPRESENTATIVES IN PRINCIPAL CITIES

AC 1391

GLOBE

Seamless WELDING FITTINGS



The only seamless welding fittings precision-processed . . . from billet . . . to tube . . . to fitting

From charging the specially designed revolving furnace with a steel billet (above) through the many succeeding steps of production, every Globe process is specialized to produce fittings of unvarying quality.

Globe precision-process manufacture begins with the billet —continues through the making of the seamless steel tube (Globe alone among welding fittings manufacturers produces seamless steel tubes)—and extends through to the production of the finished fittings.

Because Globe has highly specialized controls—at every stage of manufacture at its own plant—you can be sure of uniform high quality seamless welding fittings when you specify Globe.

Send for the Globe Welding Fittings complete catalog.

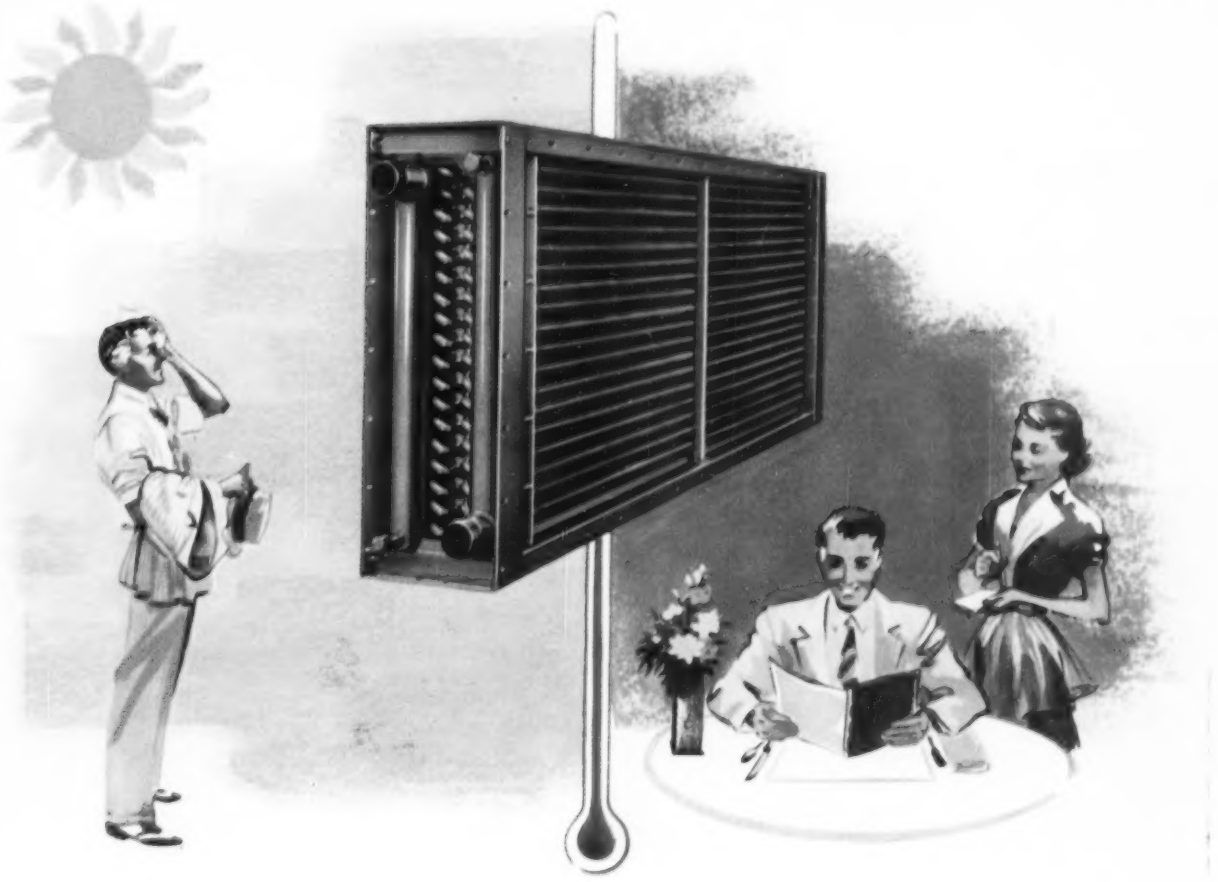
GLOBE STEEL TUBES CO.,
Milwaukee 46, Wisconsin

Chicago • Cleveland • Detroit • New York • Philadelphia • St. Louis • Denver • Houston • San Francisco
Glendale, Cal.

Producers of Globe Welding Fittings — Globe seamless stainless steel tubes — alloy-carbon seamless steel tubes — Gloweld welded stainless steel tubes — Globeiron (high purity ingot iron) seamless tubes.

AVAILABLE IN A COMPLETE LINE OF SIZES AND WEIGHTS THROUGH GLOBE DISTRIBUTORS IN ALL KEY CITIES

American Blower – a time-honored name in air handling



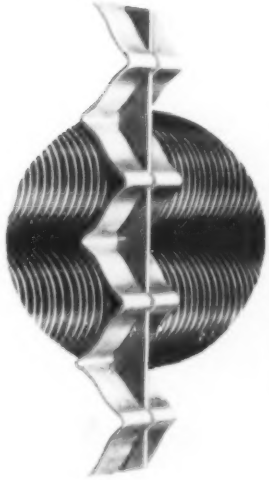
This American Blower Cooling Coil is the difference between stifling summer's heat and humidity and a delightfully refreshing atmosphere. It furnishes cool relief for the comfort of customers or workers in restaurants, stores, plants, or public buildings.

It is another one of the dependable high-quality products of American Blower—whose name on air handling or conditioning equipment is your assurance of lasting satisfaction.

Ask at our nearest Branch Office for details and data.

AMERICAN BLOWER CORPORATION, DETROIT 32, MICHIGAN
CANADIAN SIROCCO COMPANY, LTD., WINDSOR, ONTARIO

Division of American Radiator & Standard Sanitary corporation



Three types of American Blower Cooling Coils are available: (1) *Type W Water Coils* for normal cooling and dehumidifying requirements, using refrigerated or naturally cold water; (2) *Type C Cleanable Water Coils*, recommended for any water supply which tends to deposit solids in tubes and headers; (3) *Type X Direct Expansion Coils* for use with directly expanded refrigerants. Shown at left is the die-formed tube support which protects tubes and forms a brace between casing channels. Write for Bulletin 1521.

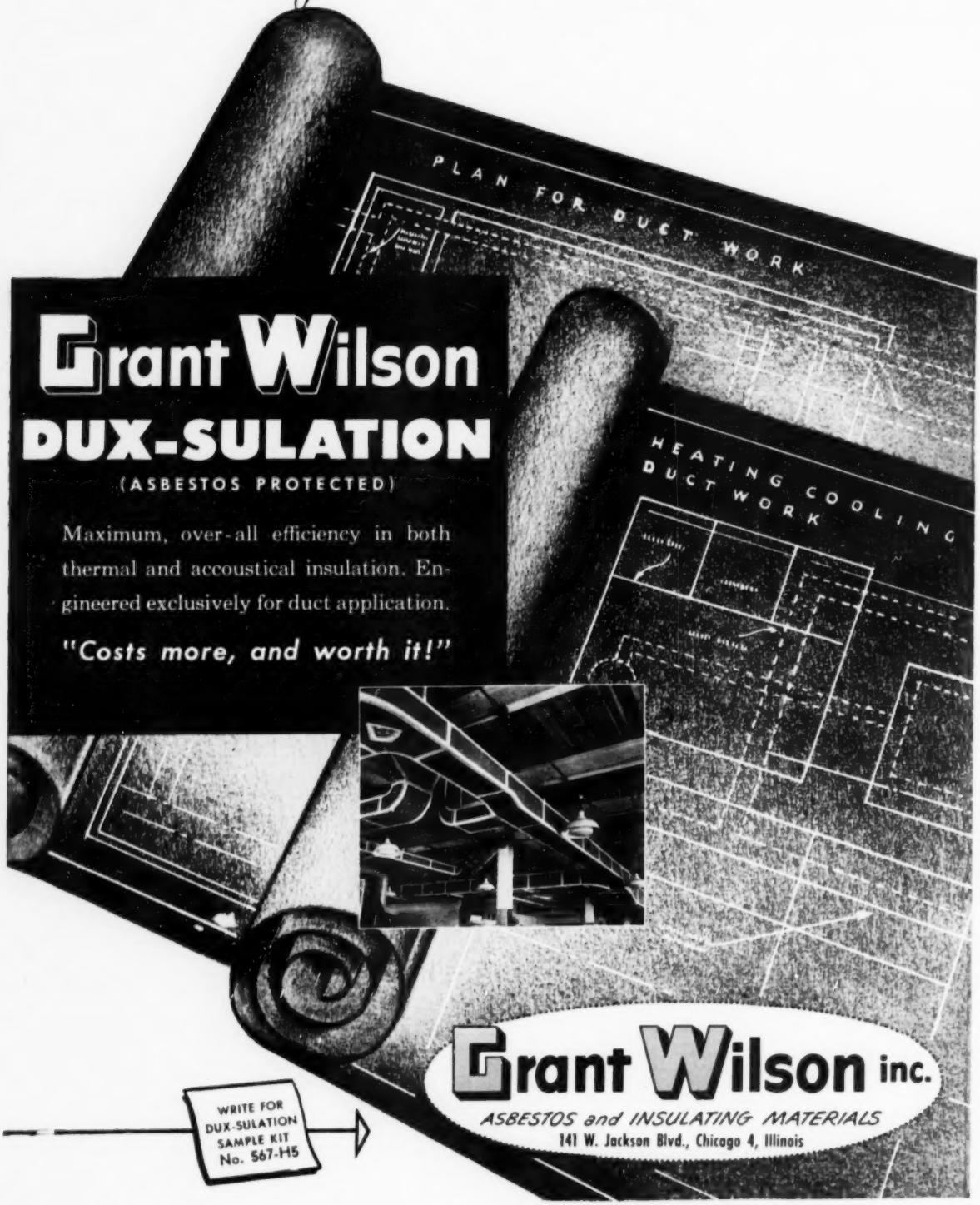
AMERICAN BLOWER

YOUR BEST BUY IN AIR HANDLING EQUIPMENT

Serving home and industry

AMERICAN-STANDARD · AMERICAN BLOWER · CHURCH SEATS & WALL TILE · DETROIT CONTROLS · KEWANEE BOILERS · ROSS EXCHANGERS

For projects where nothing but the BEST is desired.....
where nothing less than the BEST is acceptable....



Grant Wilson
DUX-SULATION
(ASBESTOS PROTECTED)

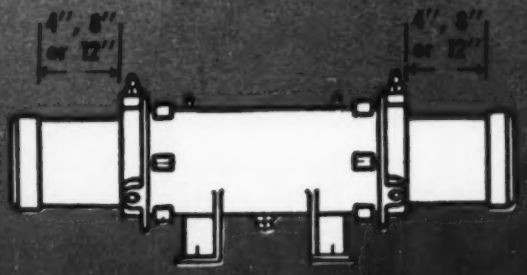
Maximum, over-all efficiency in both thermal and accoustical insulation. Engineered exclusively for duct application.

"Costs more, and worth it!"

WRITE FOR DUX-SULATION SAMPLE KIT No. 567-H5

Grant Wilson inc.
ASBESTOS and INSULATING MATERIALS
141 W. Jackson Blvd., Chicago 4, Illinois

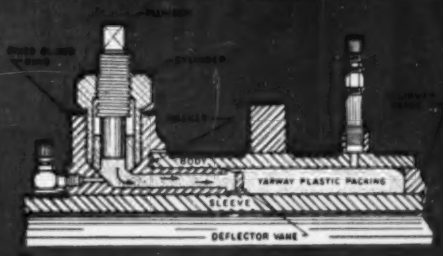
YOU NEED FEWER JOINTS



With Yarway Gun-Pakt slip-type expansion joints you need fewer joints than with other types, because each sliding sleeve has a traverse of 4", 8" or 12" . . . maximum expansion being 24" for a double-end joint.

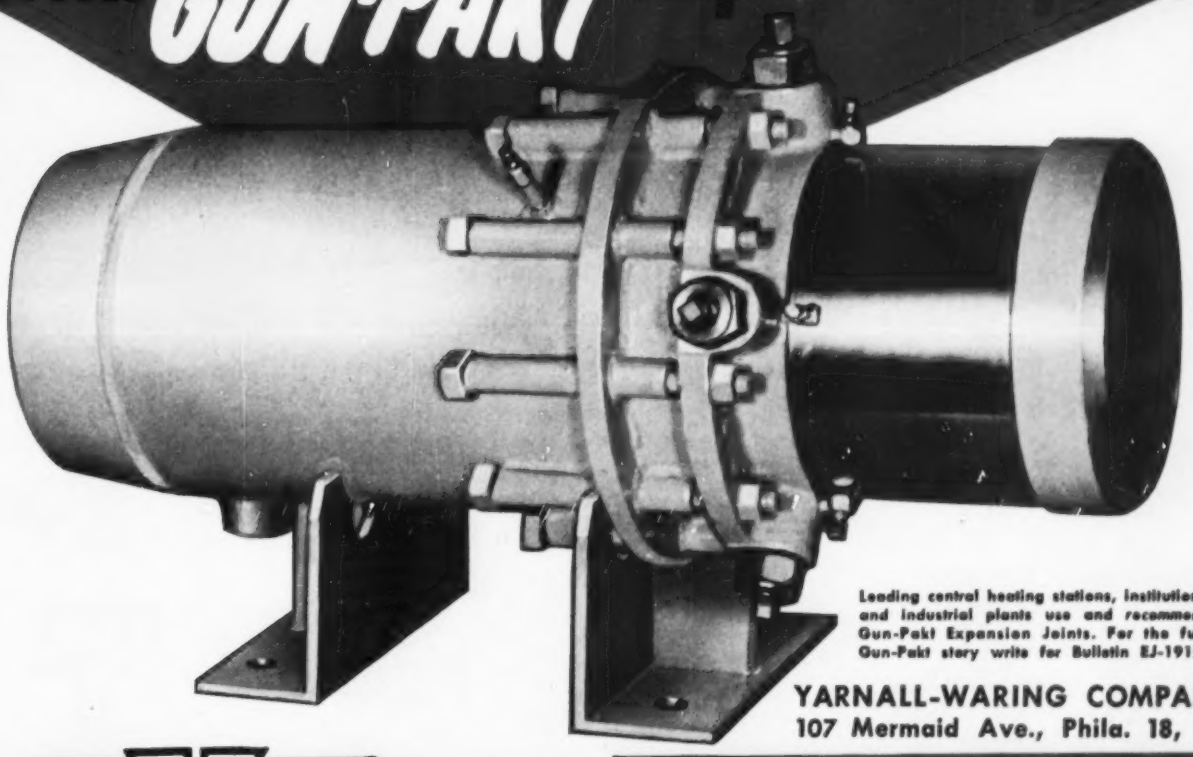
For example, one single-end Yarway Gun-Pakt joint with an 8" traverse is all that is needed for a 200 ft. run of steel pipe carrying saturated steam at 350 psi.

AND LESS MAINTENANCE



No need for shutdowns. Yarway Gun-Pakt Joints are serviced under full steam pressure. Just insert a plug of Yarway plastic packing, twist a wrench and the job is done. Maintenance and production headaches are saved!

with GUN-PAKT expansion joints



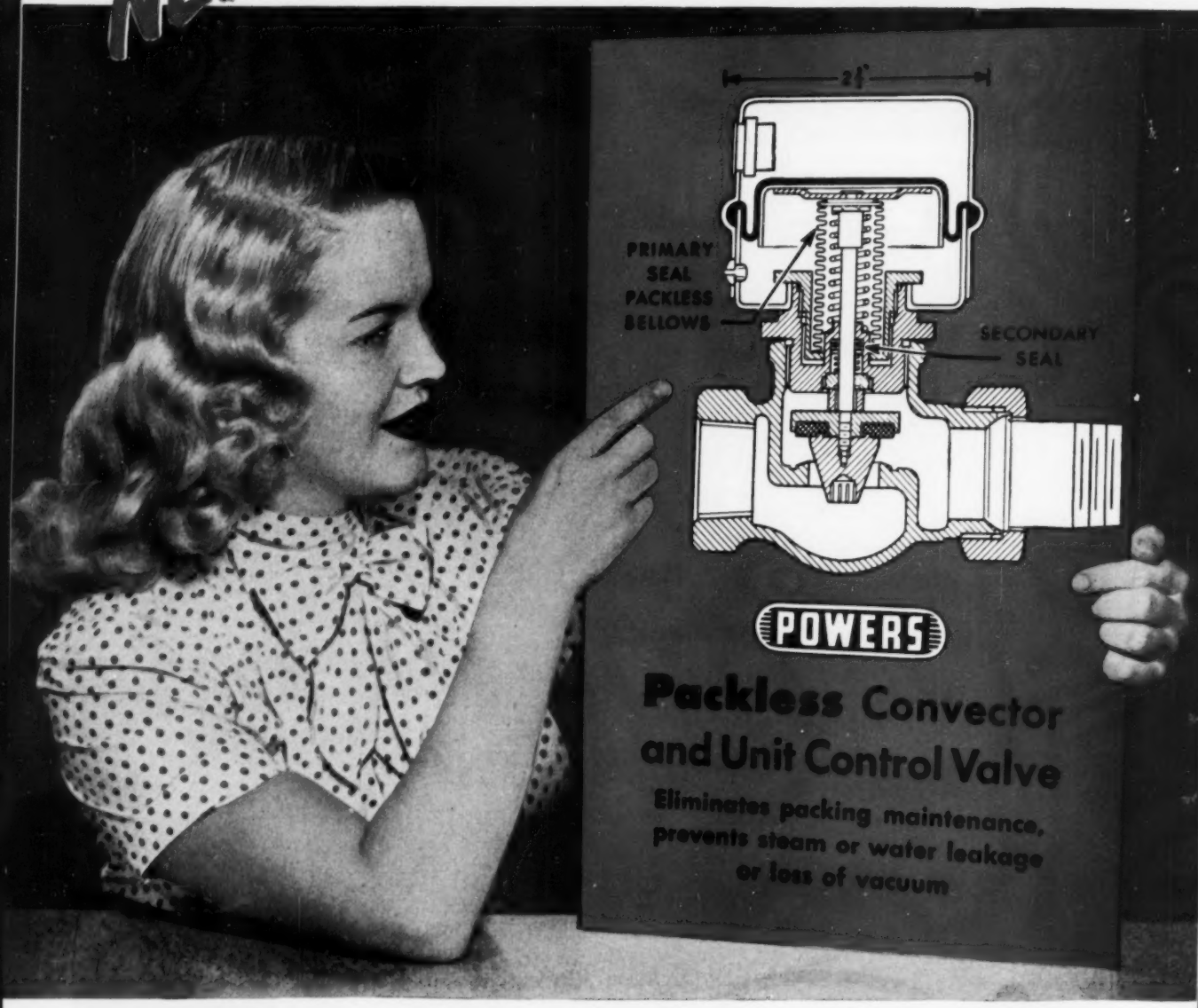
Leading central heating stations, institutions and industrial plants use and recommend Gun-Pakt Expansion Joints. For the full Gun-Pakt story write for Bulletin EJ-1912.

YARNALL-WARING COMPANY
107 Mermaid Ave., Phila. 18, Pa.

YARWAY

GUN-PAKT EXPANSION JOINT

NEW! POWERS PNEUMATIC *Systems of*


2½"
PRIMARY SEAL PACKLESS BELLOWS
SECONDARY SEAL
POWERS
Packless Convector and Unit Control Valve
Eliminates packing maintenance, prevents steam or water leakage or loss of vacuum

POWERS-**PACKLESS**-VALVES

Never require re-packing.

Real Economy in Maintenance year after year

Flared Ends

Straightway Union

Angle Union

◄ Screwed Ends

Reverse Flow Double Union

Straightway Union

Angle Union ►

3-Way Screwed Ends ►

Available in various types and sizes for control of convectors, unit ventilators, unit air conditioners and radiators.

Automatic Temperature Control
Now Include

POWERS-PACKLESS-VALVES

For Controlling Convectors, Unit Ventilators, Unit Air Conditioners and Radiators.

Now, at NO Extra Cost — users of Powers pneumatic control systems will get the additional benefits of still lower operating and maintenance costs — insured by Powers packless valves.

Duo-seal Construction Gives Them Superior Performance. Bronze packless bellows is the Primary Seal which eliminates packing maintenance — packing friction — steam and water leakage or loss of vacuum. Secondary Seal permits servicing of valve top without draining the water system or shutting off the steam supply.

Typical Specifications for POWERS-Packless-Pneumatic Control Valves

Control valves for convectors, radiators and unit ventilators shall be packless type with bronze packless bellows to eliminate steam and water leakage or loss of vacuum. This packless bellows shall be located so that it is not subject to corrosive action of the steam or water. A spring-loaded secondary seal shall be provided to permit convenient inspection or servicing of valve top without draining the water system or shutting down the steam supply.

Valve sizes shall be determined by control manufacturer for capacities specified. Type of valve body and valve top to be used shall be as required to best satisfy the application.

Valves shall be equipped with phosphor bronze bellows or Neoprene diaphragms of sufficient size to close off against specified line pressures. Diaphragms shall be replaceable. Valves shall be equipped with characterized throttling plugs to insure a measured flow of steam or water in direct relationship to the demand of the controlling thermostat.

THE POWERS REGULATOR CO.

Skokie, Ill. • Offices in Over 50 Cities in the U. S. A., Canada and Mexico
See Your Phone Book

OVER 60 YEARS OF AUTOMATIC TEMPERATURE CONTROL

Banish PACKING Maintenance

No Loss of Vacuum
... leakage of air reduces efficiency of heating system and increases corrosion in return lines

No Steam or Water Leakage

(b18)

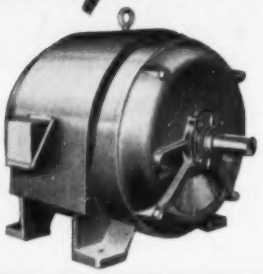
Only a Few of POWERS Complete Line of Modern Control Valves
for Regulating Heating and Air Conditioning Systems
FLOWRITE VALVES
METAFLOW VALVE
PACKLESS VALVES
METAFLOW VALVE
FLOWRITE VALVES

Wagner
ELECTRIC MOTORS
...the choice of leaders in industry

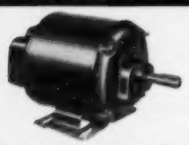
Wagner Quality Motors *for your product or your plant*

Whatever your motor requirements may be—single-phase or polyphase, 1/125 hp or 400 hp—Wagner can offer a standard motor that is entirely dependable in its specific application. The wide variety of motors shown here is typical of the many motors and motor modifications in the complete Wagner line.

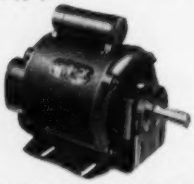
At right is TYPE RP—open type polyphase squirrel-cage motor. It is drip-proof and suitable for all general purpose applications. 1/6 to 400 hp.



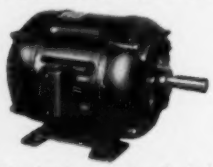
SINGLE-PHASE



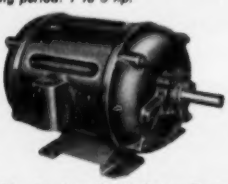
TYPE RB—*Split-phase Induction. For easy starting applications with high starting current. 1/20 to ½ hp.*



TYPE RK—*Capacitor-Start Induction. For general purpose applications requiring high starting torque—normal starting current. 1/6 to 5 hp.*

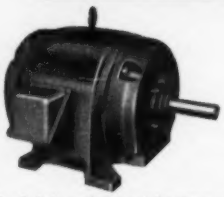


TYPE RG—*Repulsion-Induction. For high starting torque applications involving a very long starting period. 1 to 5 hp.*

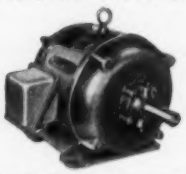


TYPE RA—*Repulsion-Start Induction. For general purpose applications with high starting torque—low starting current. ½ to 15 hp.*

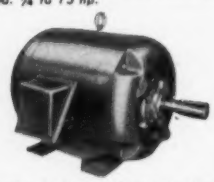
POLYPHASE MOTORS



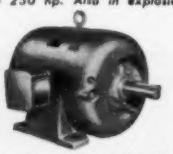
TYPE XP—*Splashproof. Protected against splashing or dripping liquids. ¾ to 200 hp.*



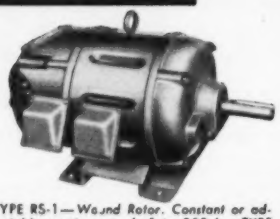
TYPE TP—*Totally-enclosed, non-ventilated. Fully protected. ¼ to 15 hp.*



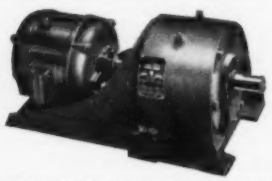
TYPE CP—*Totally-Enclosed Fan-Cooled. Protected against dirt, chips, abrasives or fumes. Steel frame. 1 to 250 hp. Also in explosion proof type HP.*



TYPE EP—*Corrosion-resistant Totally-Enclosed Fan-Cooled. Cast iron frame. 2 to 250 hp. Also available in explosion proof type JP.*



TYPE RS-1—*Wound Rotor. Constant or adjustable varying speed. 1 to 250 hp. TYPE RS-2 for intermittent service. 2 to 200 hp.*



GEAR MOTORS—*Single-phase or Polyphase. Open or enclosed types. 1/20 to 50 hp.*

* * *

In addition to a complete line of motors, Wagner also furnishes Increment Type Motor and Starter Combinations, Jet Pump Motors and a complete line of Transformers: Dry-type, Distribution and Power. Wagner engineers welcome an opportunity to serve you. Consult the nearest of our 32 Branch offices, or write direct.

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AUTOMOTIVE BRAKE SYSTEMS – AIR AND HYDRAULIC

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Super-Silvertop . . . THE ENGINEERED STEAM TRAP

✔ **CHEMICAL** "This plant has had several of your large capacity traps in operation for a number of years and are quite satisfied with them." New York, N. Y.

✔ **PAPER PRODUCTS** "Approx. 30 traps on wax applicators have been replaced with Super-Silvertop inverted bucket steam traps with net savings in steam of 4,000 lbs. for hour." Augusta, Ga.

✔ **FOOD** "Since trapping our kettles with Super-Silvertop Steam Traps we've had a steam savings, had no trouble with the traps, nor have we purchased repair parts." Pittsburgh, Pa.

✔ **HOSPITAL** "We use your trap altogether. We have 100 to 150 Anderson Traps in use, which we find very satisfactory and reliable." Muskogee, Okla.

✔ **DRY CLEANING** "These traps really work and do an excellent job with no care whatever." North Tonawanda, N. Y.

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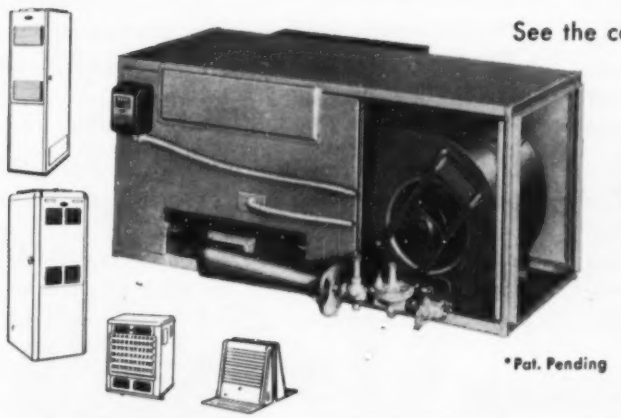

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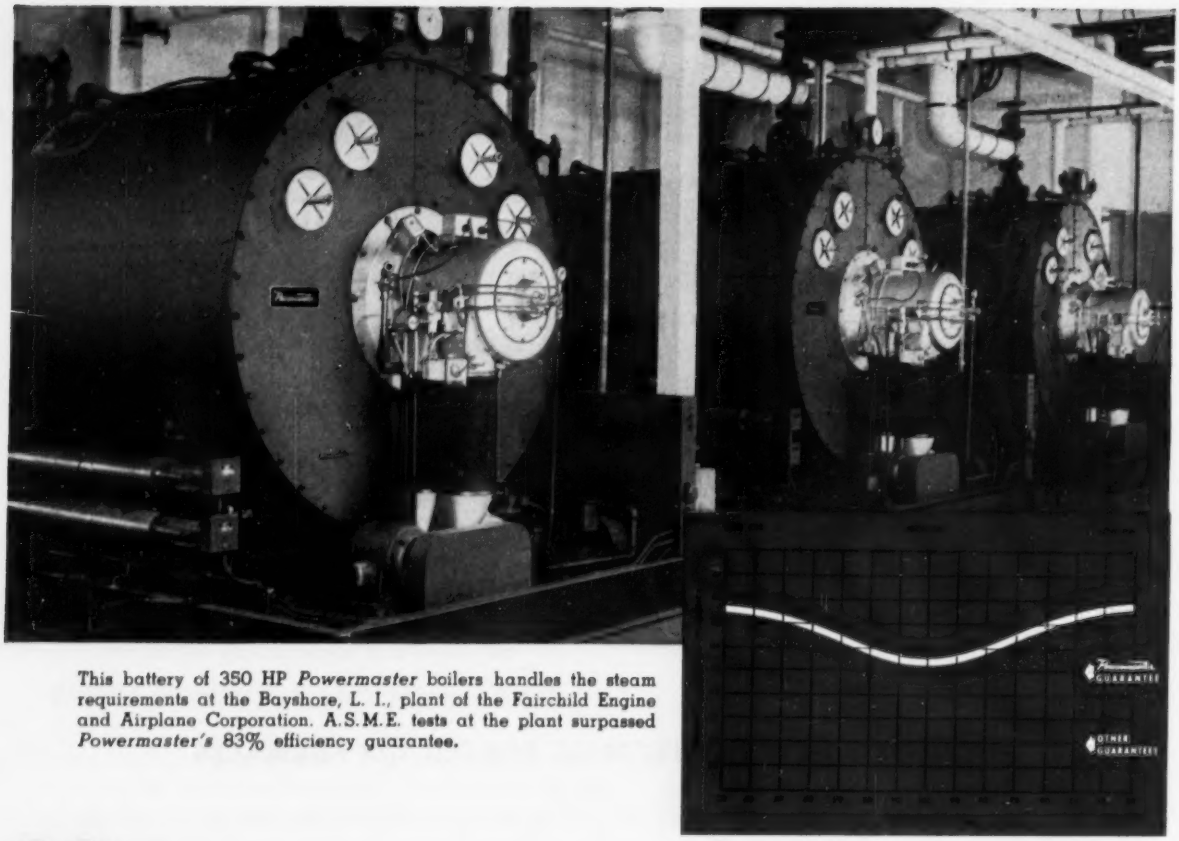

This battery of 350 HP *Powermaster* boilers handles the steam requirements at the Bayshore, L. I., plant of the Fairchild Engine and Airplane Corporation. A.S.M.E. tests at the plant surpassed *Powermaster's* 83% efficiency guarantee.

83% minimum efficiency with No. 6 Oil guaranteed only by Powermaster®

The "pay-off" on a boiler is its operating efficiency!

Take a look at this typical efficiency curve of *Powermaster* . . . then compare A.S.M.E. tests with those of any other boiler! At less than full load (which is normal in field operation) notice that *Powermaster* efficiency actually *increases.*

There's a reason for such efficiency. The *Powermaster* is the development of 68 years' experience in boiler manufacture. Continuing research and progressive engineering have consistently been reflected in *Powermaster* design:

- **FIRST to provide the Voriflow air-atomizing burner.**
- **FIRST to provide full modulating cam control.**
- **FIRST to provide immediate change-over from oil to gas firing.**
- **FIRST to provide a complete packaged unit.**

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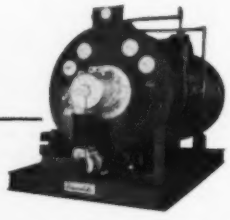
Powermaster®

PACKAGED AUTOMATIC BOILERS

In sizes to 500 HP; pressures to 250 psi.



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Conduit containing 10 pipes in typical installation. Pipes anchored to base, support blocks in place prior to pouring of Z-Crete. Low cost construction.

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No pipe arrangement too tough for this versatile insulation! Z-CRETE affords permanent insulating efficiency—forms a safe, solid monolithic protection around one pipe or a *dozen* in the same conduit . . . without joints or voids. Hundreds of thousands of feet of Z-CRETE have been installed in all parts of the country and in all types of soil conditions. Any number, size or arrangement of pipes can be designed into a Z-CRETE conduit. Made of inorganic, rotproof, insulating concrete—monolithic pour assures restricted water movement around the assembly. And you'll find it's usually the most economical system to install. Write for complete details today!

No Other Insulation for Underground Piping Offers All These Superior Advantages!

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- **More Efficient**—Six inches of insulation around piping provides plus insulation value—eliminates heat loss due to air movements.
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- **Readily Available**—No critical materials required. Experienced, licensed applicators, located in all parts of the country, are ready to serve you.

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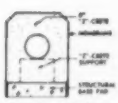
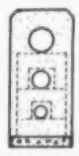
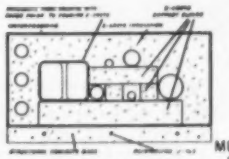


SINGLE PIPE CONDUIT

TWO PIPE CONDUIT



PIPE OVER PIPE



MULTIPLE PIPE CONDUIT

MULTIPLE PIPE CONDUIT WITH STEAM TRACER

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"Five different types of mountings"
"Perfect balance between air temperatures and velocities"

Blow your space heating troubles away

Why let space heating troubles give you a headache? Just remember—*there's a Dunham Blower Type Unit Heater made to order for every large area heating and ventilating problem.*

For example, Dunham gives you a choice of five different types of heater mountings—floor, wall, ceiling, inverted or platform. Each comes in a range of sizes and capacities. Each can handle steam or hot water. And all can be equipped with nozzles, dampers, filter sections and duct connections to satisfy most every heating and ventilating need.

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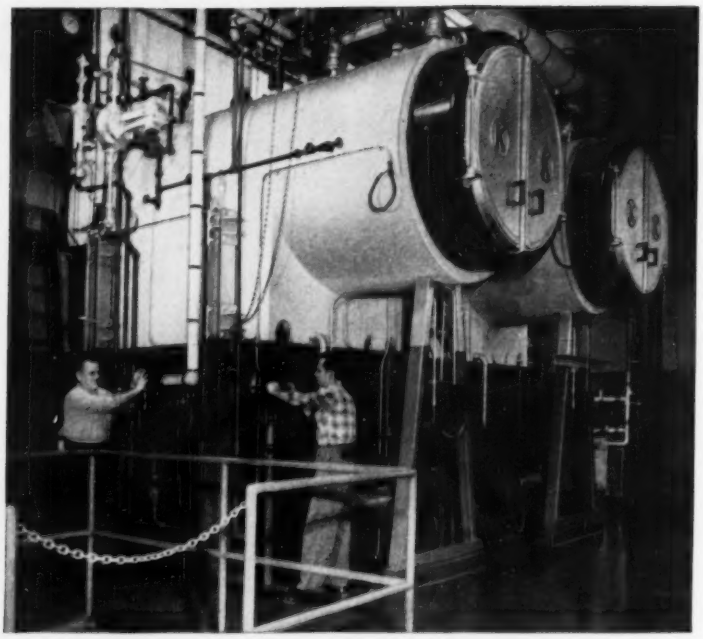

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STEEL BOILERS

Set a Kewanee alongside other boilers and even a quick look shows their extra ruggedness, finely finished castings and other evidences of a high quality product. Then look inside! Check the specifications, measurements, size of fire chamber, area of heating surface and one finds many other differences. More engineering, *more material*, more labor and more experience go into every Kewanee . . . whether for heating, power or process steam . . . so owners *get more from them.*

With experienced engineers and mechanics on their staff, a great air line knows mechanical equipment. So it means much when concerns such as Northwest Air Lines install Kewanee Boilers in an important building.

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Colo.	Denver	Veterans Administration Hospital
Conn.	Derby	Griffin Hospital
Conn.	Norwich	Norwich State Hospital
Conn.	Willimantic	Windham Community Memor.
Fla.	Tampa	S. W. Fla. T.B. Sanatorium
Ga.	Monticello	Jasper County Hospital
Idaho	Boise	St. Adolphus Hospital
Ill.	Chicago	Michael Reese Hospital
Ill.	Evanston	Evanston Hosp.–Bldgs. A, B & C
Iowa	Audubon	Audubon County Hospital
Iowa	Cedar Rapids	St. Lukes Hospital
Ky.	Louisville	Veterans Administration Hospital
Mich.	Detroit	Receiving Hospital
Minn.	Fort Snelling	Veterans Administration Hospital
Minn.	Redwood Falls	New Hospital
Md.	Cheverly	Prince Georges County Hospital
Miss.	Hazelhurst	Copiah County Hospital
N. J.	Newton	Newton Memorial Hospital

State	*City*	*Hospital*
N. J.	Secaucus	Hudson County Hospital
N. Y.	New York City	Beth El Hospital
N. Y.	New York City	E. Bronx T. B. Hospital
N. Y.	Beacon	Matteawan State Hospital
N. Y.	Buffalo	Roswell Park State Hospital
N. Y.	Ithaca	Herman M. Biggs Memorial
N. Y.	Utica	Utica State Hospital
N. Y.	Walton	Delaware Valley Hospital
Ohio	Ashtabula	Ashtabula General Hospital
Ohio	Dayton	St.-Elizabeth's Hospital
Pa.	Danville	Danville State Hospital
Pa.	Embreeville	Embreeville State Hospital
Pa.	New Kensington	Citizens General Hospital
Tex.	Corpus Christi	Corpus Christi Memorial Hospital
Tex.	Denton	Flow Memorial Hospital
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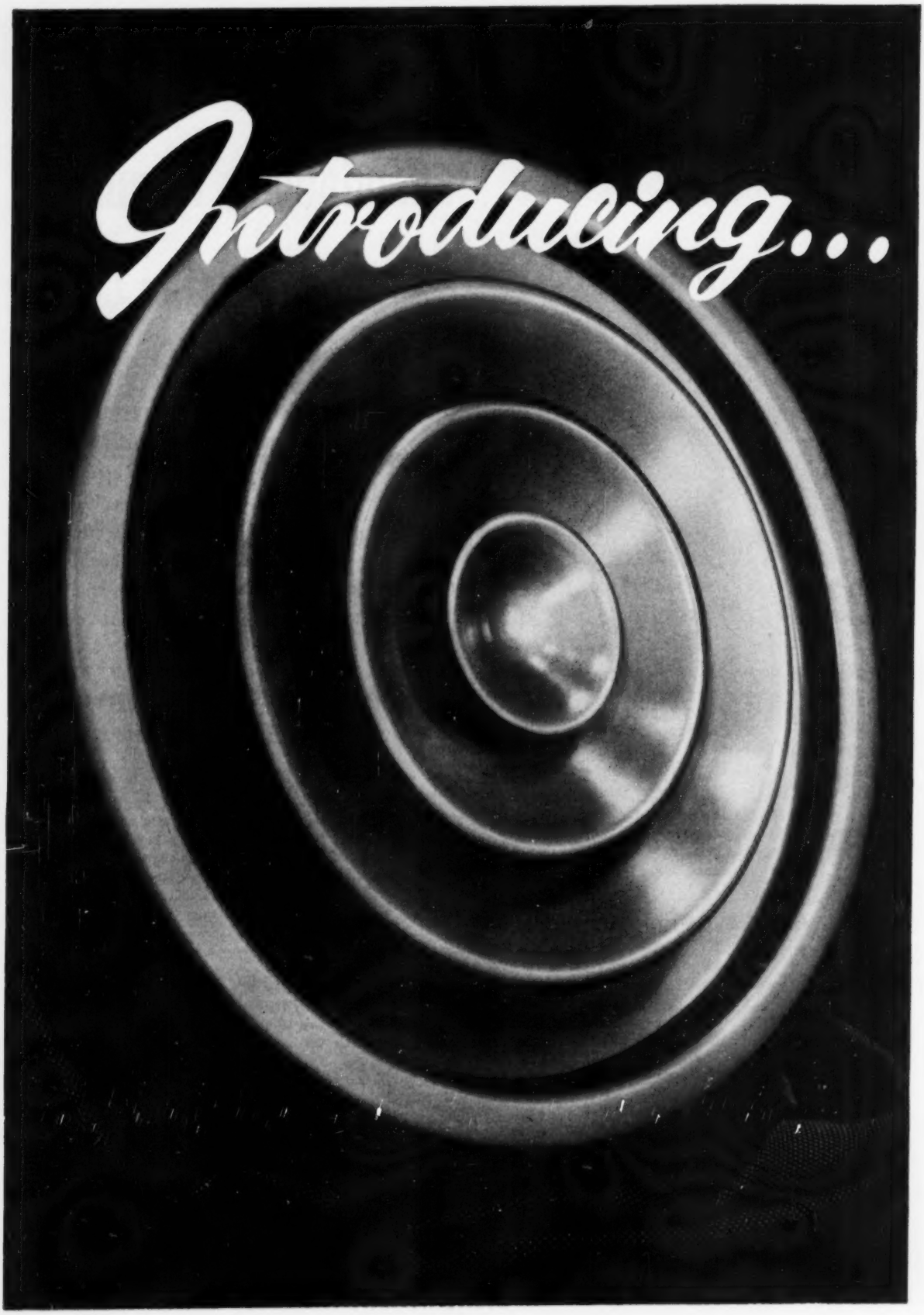
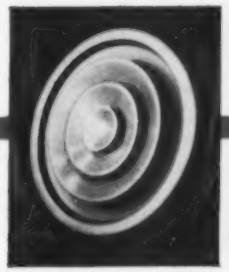

Introducing...

THE BEAUTIFULLY STYLED

Aerofuse Type 'P' Series

CEILING DIFFUSER



Aerofuse—a famous name in ceiling diffusers—is now presented in an entirely new design that sets a new high in appearance and performance at the vital point of air delivery.

Beautifully styled, the four diffuser types in the new Aerofuse line have matching facial contours, smooth, graceful lines that harmonize with modern interior design and decor. An important feature of the Type "P" Series, all diffusers have the identical number of concentric rings. Thus when requirements call for the installation of more than one Aerofuse type – or more than one size – in the same area, you can be sure of uniform appearance.

Engineered to meet rigid specifications of efficient, satisfactory performance, each diffuser type in the new Aerofuse line is designed for a specific air delivery job. Outstanding is the Type "PA" adjustable diffuser designed so that air distribution pattern may be varied from horizontal to vertical by turning center cup . . . Type "PF" is a flush mounted, fixed pattern diffuser . . . Type "PS" is a slightly stepped-down high capacity diffuser for industrial applications . . . Type "PR" is a flush type, supply and return diffuser.

New Catalog No. 105 contains complete description of the Aerofuse Type "P" Series, size selection information, and engineering data. Write for your copy today to Tuttle & Bailey, Inc., New Britain, Conn.

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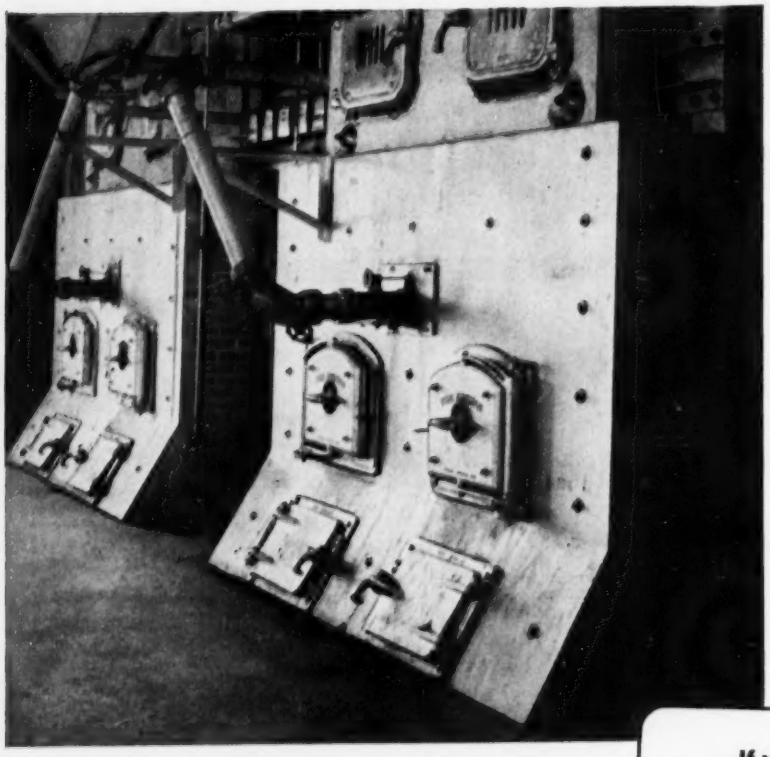
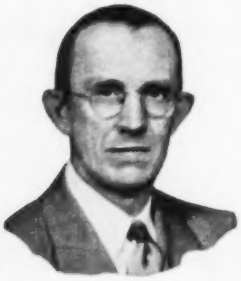
"Modernizing our coal installation cut monthly fuel bills from $777 to $650... labor costs from $120 to only $40!"





says Mr. William C. Musch, Chief Engineer, Allen Memorial Hospital, Waterloo, Iowa.

Here's Allen Memorial Hospital's new steam plant. Boilers are fired by pneumatic spreader stokers. The plant now operates with ⅓ the manpower formerly needed. Compared to the old installation, the new equipment saves 18¢ on every thousand pounds of steam generated. The savings realized by this small plant will pay for the entire installation in 7½ years.

● Whether you plan to modernize your steam plant, or build a new one... whether you burn a lot of fuel, or a little... you can cut a *big* percentage from your operating costs by using up-to-date coal equipment.

A consulting engineer can show you how you can cut labor costs to a minimum with automatic coal- and ash-handling equipment... how you can get more steam for every dollar when you burn coal in a modern installation designed to meet your *specific* needs.

Of all fuels, only coal has ample reserves for the future. And to produce this coal, America has the world's most efficient coal industry. That means that coal users, unlike those committed to other fuels, get the advantages of dependable supply and relatively more stable prices—now and for the future!

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COAL *in most places is today's lowest cost fuel.*

COAL *resources in America are adequate for all needs—for hundreds of years to come.*

COAL *production in the U. S. A. is highly mechanized and by far the most efficient in the world.*

COAL *prices will therefore remain the most stable of all fuels.*

COAL *is the safest fuel to store and use.*

COAL *is the fuel that industry counts on more and more—for with modern combustion and handling equipment, the inherent advantages of well-prepared coal net even bigger savings.*

BITUMINOUS COAL INSTITUTE

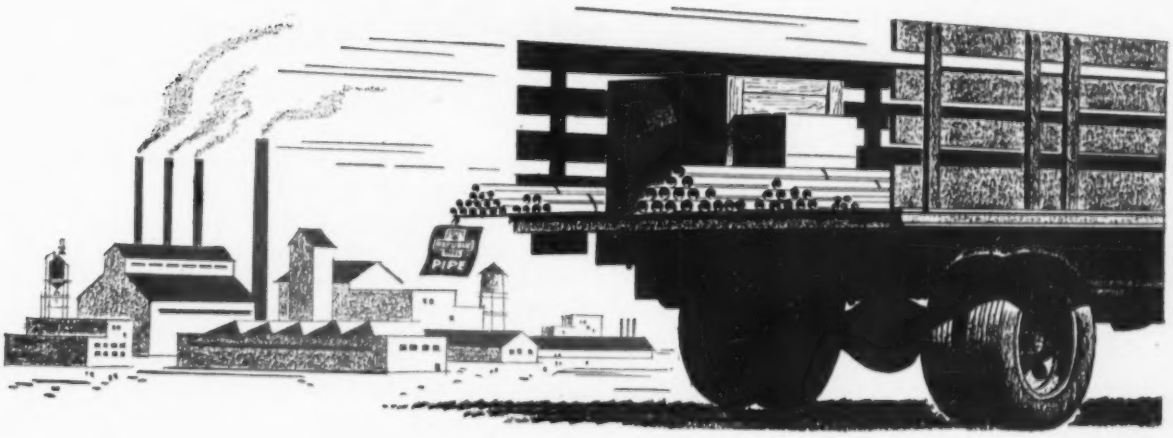
A Department of National Coal Association, Washington, D. C.

FOR HIGH EFFICIENCY FOR LOW COST

YOU CAN COUNT ON COAL!

Stockpile on Wheels

FOR PIPE AND FITTINGS USERS



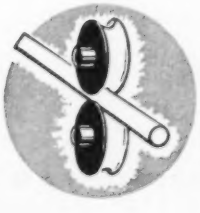
Always a step ahead of your needs . . .

● Using the services of your Republic Steel Pipe Distributor is just like having a stockpile on wheels. His stock contains just the sizes of steel pipe you need—plus the fittings, valves, fixtures, controls, tools—everything you need for a plumbing, heating, refrigeration or other piping job.

His stockpile saves you capital which might otherwise be tied up in stocks. It saves you floor space. It saves you insurance and handling costs.

His delivery is as fast as you need it—a few lengths of pipe or a truckload. Why not get acquainted with your Republic Steel Pipe Distributor and the high-quality materials he stocks?

REPUBLIC STEEL CORPORATION
GENERAL OFFICES • CLEVELAND 1, OHIO
Export Department: Chrysler Building, New York 17, N. Y.



Easy to bend, thread and close coil
Easy to weld by all methods
Uniformly ductile
Uniformly strong
Uniformly clean and scale-free
Uniform wall thickness, diameter, concentricity
Economical uniform lengths, extra long lengths

Republic STEEL PIPE

REPUBLIC STEEL

New Modular MULTI-VENT® concealed ceiling panels

COSTS NO MORE

than ordinary air diffusing systems!

Yes! That is the big news in commercial, institutional, and industrial air conditioning for 1953.

Now you can specify this superior low velocity pressure displacement type of air distribution for metal pan ceilings at the same or *lower* cost than the high velocity injection type.

This is possible because the new MODULAR PANELS are so extremely simple and rapid to install. They can be assembled and installed in a few seconds by hand without the use of tools —a tremendous saving in labor cost!

Distributing air by Multi-Vent's gentle pressure displacement assures perfectly even air motion, and exceptional uniformity and control of room temperatures. The total absence of strong air streams or blow eliminates all the usual sources of draft complaints and permits complete freedom in locating panels and in relocating partitions.

Write today for detailed literature.

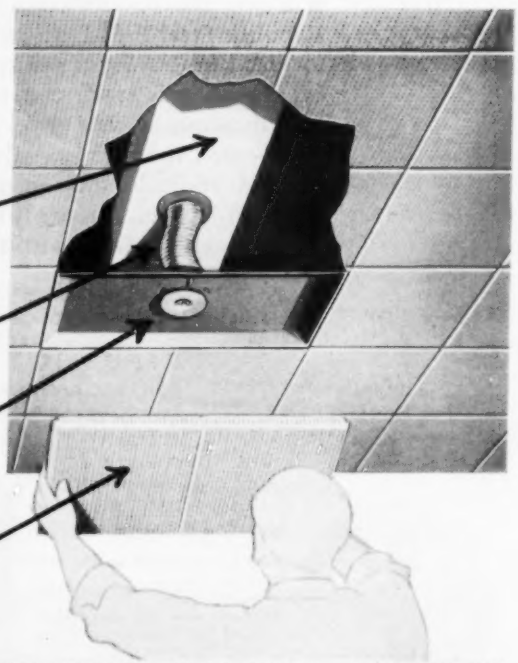
LABOR SAVING INSTALLATION FEATURES

■ **ADAPTABLE** . . . Duct can be shop built with 3-inch diameter openings at approximate panel locations. Duct work can be installed, flexible tubes with valve snapped in, and system balanced prior to and independent of ceiling erection. Panels can be located without regard to position of lighting fixtures and partitions.

■ **FLEXIBLE** . . . compressible tubing permits wide latitude in alignment, thus radically reduces installation cost by eliminating all need for time consuming close fitting sheet metal work.

■ **ADJUSTABLE** . . . orifice valve can be simply set by wing nut for varied amount of air delivery. Individual panel adjustments do not disturb the overall balance of the system.

■ **COMPLETELY CONCEALED** . . . ANY STANDARD PERFORATED 12" x 24" ACOUSTICAL METAL CEILING PAN (supplied by the ceiling contractor) functions as the distribution plate for the MODULAR MULTI-VENT PANEL. The panel simply replaces the acoustical pad and nests snugly in the pan which snaps into ceiling tee runner, unhampered. Ceiling face is undisturbed.



MULTI-VENT DIVISION **THE PYLE-NATIONAL COMPANY**

Sales and Engineering Representatives in Principal Cities of United States and Canada

1373 North Kostner Ave. Chicago 51, Illinois

They Give...

PERMANENT PIPE-LINE SECURITY

From *Master* Craftsmen come the world's finest *FITTINGS* . . . drop forged from solid billets of specially blended *STEELS*.

Your pipe connections can be harmonious and lasting . . . even endure beyond the normal life of the system . . . if proper consideration is given the compatibility of their meeting. Many millions of feet of pipe and tubing have been brought together by W-S Double-Diamond Forged Steel Fittings in lasting unions against time . . . heat . . . pressure . . . turbulence . . . corrosion . . . oxidation . . . vibration . . . reduction and shock.

Such fortunate meetings withstand the adverse conditions of *ANY* service environments because W-S FITTINGS are inherently superior to those made by methods other than PRECISION MACHINING from solid FORGED stock.

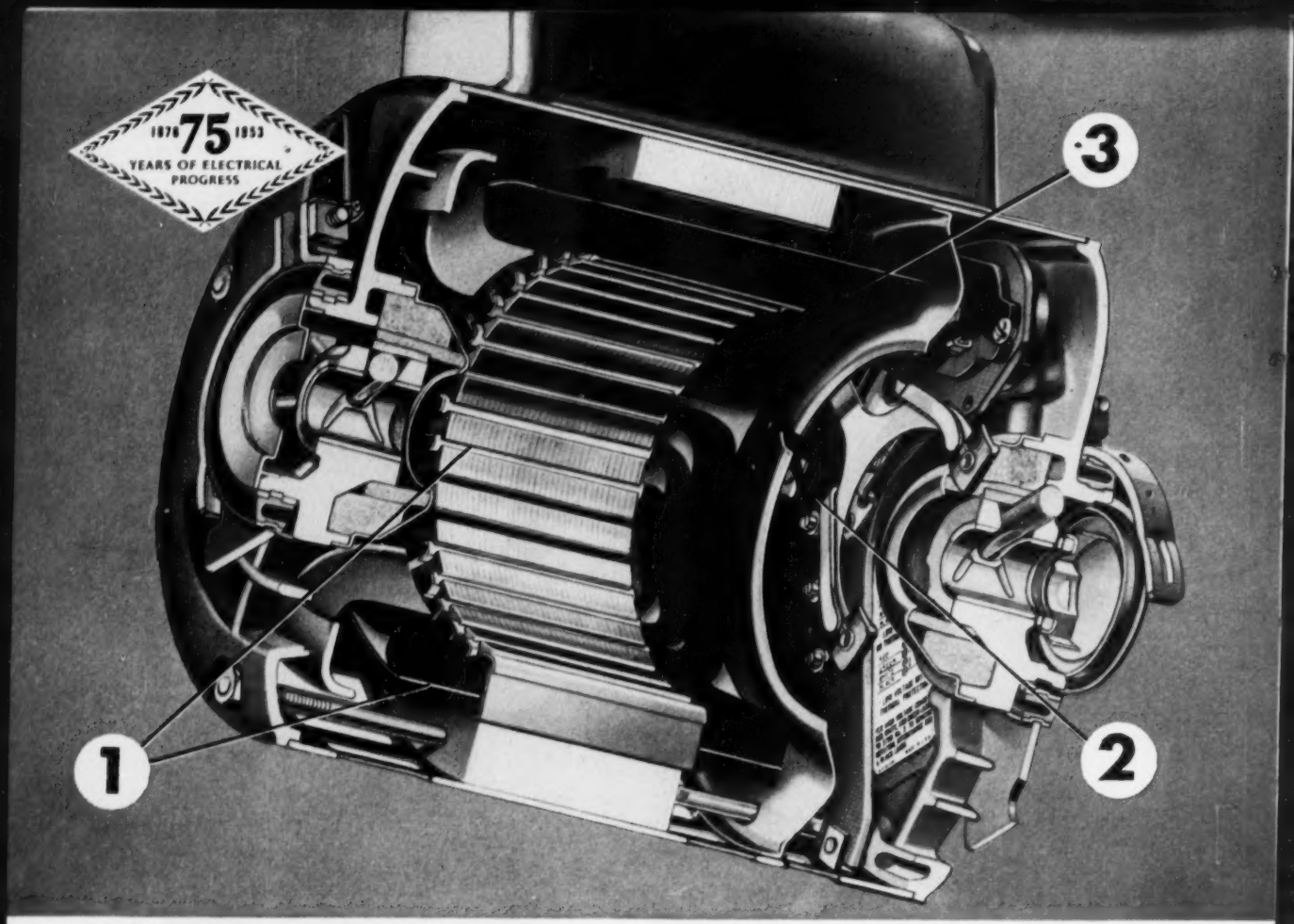
Whatever your pipe or tubing application, you can profit from the permanence of W-S Double-Diamond (Screw-End and Socket-Weld) Forged Steel Fittings.

SOLD THROUGH LEADING DISTRIBUTORS

WATSON-STILLMAN FITTINGS DIVISION

H. K. PORTER COMPANY, INC.

132 ALDENE RD., ROSELLE, NEW JERSEY



G-E FHP MOTOR CUTAWAY—The numbers shown here are keyed to the insulating materials which enable this General Electric motor to effectively withstand the harmful effects of moisture, oils, mild acids and alkalies and the results of aging.

New G-E insulation system

. . . first use of "Mylar" in electric motors

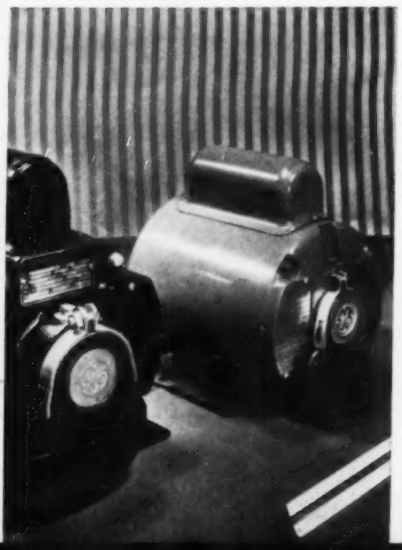
General Electric's new Fhp motor is the first to offer the superior insulation qualities of DuPont Company's "Mylar" Polyester Film. An insulator that raises the safety factor of everyday motor operation while contributing to greatly increased motor life through improved insulation. "Mylar" in combination with G.E.'s already proven Formex wire, braidless Neoprene leads and Glyptal varnish now offers you the most advanced type of motor insulation. An insulation system that means better motor protection . . . longer motor life even under abnormal conditions.

This new G-E Fhp general-purpose motor gives you full NEMA performance . . . reduces shipping and handling costs with up to 50% less weight and 40% less bulk. For complete information, contact your nearest G-E Apparatus Sales Office or write Section 702-1 for Bulletin GEA-5567. General Electric Co., Schenectady 5, N. Y.

*DuPont trade-mark

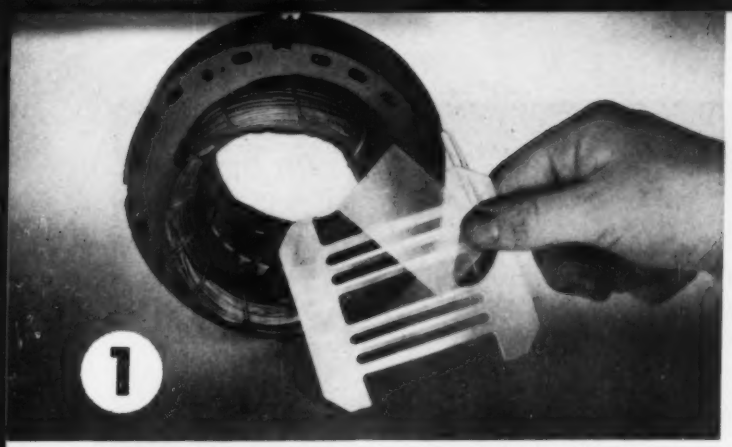
**Reg. trade-mark of the General Electric Co.

SMALLER . . .

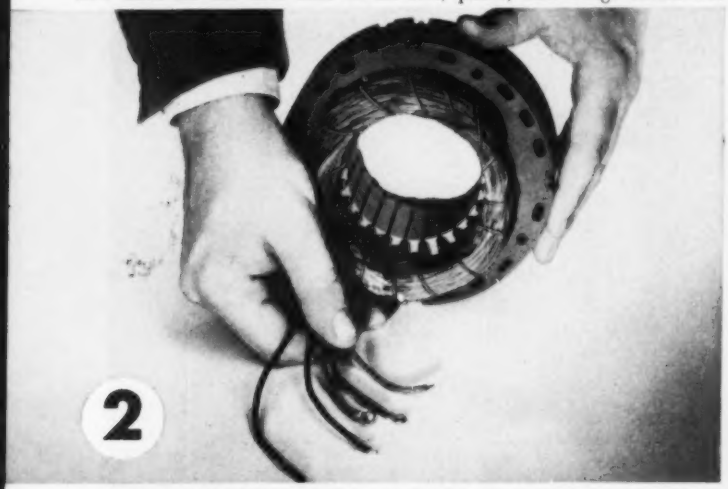


You can put your confidence in—

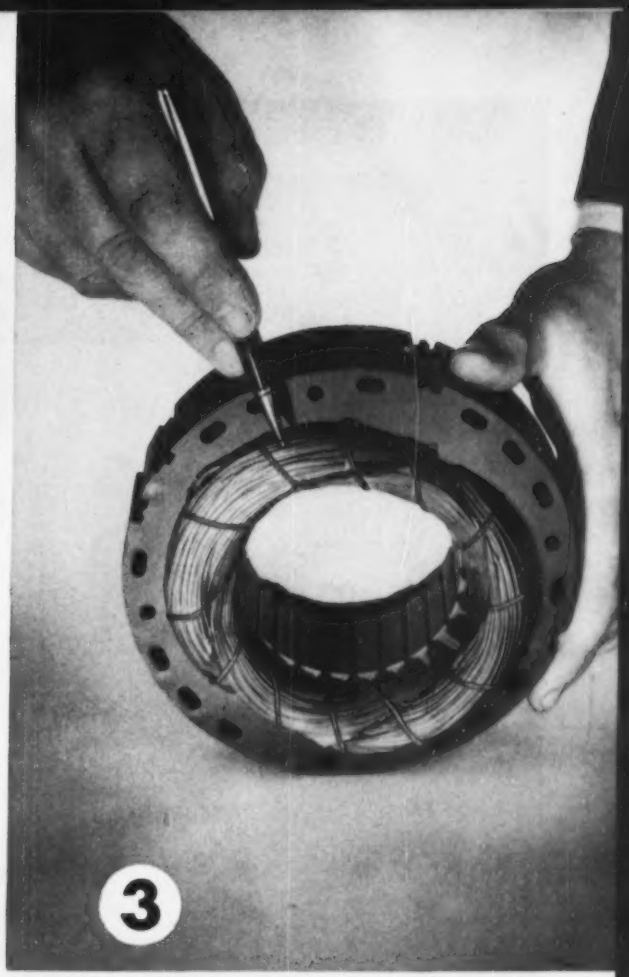
GENERAL ELECTRIC



"MYLAR" POLYESTER FILM** with extremely high dielectric strength now used for the first time in all slot, phase, and wedge insulation.



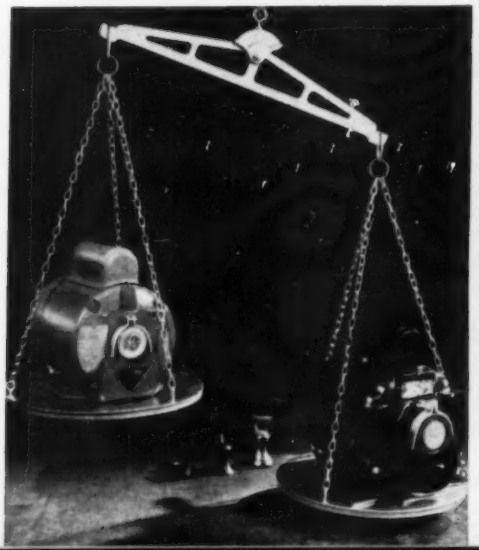
BRAIDLESS NEOPRENE LEADS of clear and permanent color retain high insulation strength and flexibility under severe operating conditions.



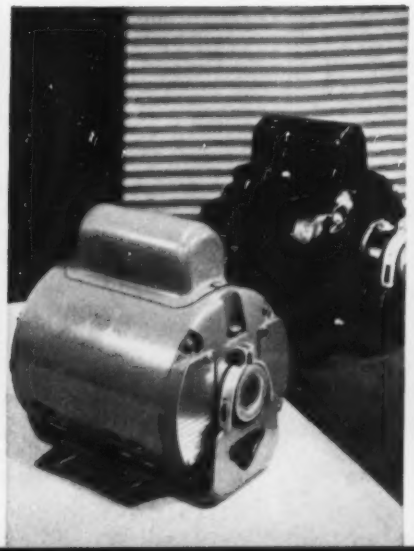
FORMEX WIRE PLUS GLYPTAL**** stator coating balance physical and electrical properties for top protection.

lengthens fhp motor life!

LIGHTER . . .



BETTER LOOKING . . .



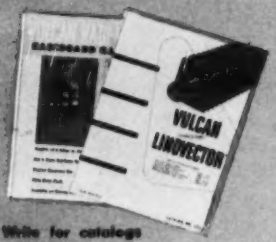
MORE VERSATILE!

STRENGTH • STYLE • SIMPLICITY • ECONOMY

with each installation of **VULCAN RADI-VECTOR**

That's the "Beauty" of Vulcan . . . for *consulting engineers* because of the overall simplicity of Vulcan design . . . Vulcan fits into any plan. For *contractors* because of ease of installation . . . Vulcan requires less piping, fewer fittings and supports. For *home owners* because of trouble-free operation, quick response to heating controls and ease of keeping clean.

Also made in Canada Under Trade Name of Heal Radiation by the Vapor Car Heating Co. of Montreal.



Write for catalogs 53 B and No. 125.

The VULCAN RADIATOR Co. 16 Francis Ave., Hartford, Connecticut

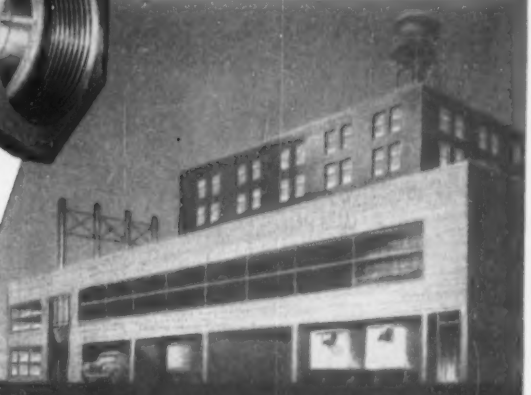
To know how good valves can be, install valves that are known to be good

Fig. 375—200-pound Bronze Gate Valve with renewable, wear-resisting "Powellium" nickel-bronze disc.

DEPENDABLE VALVES SINCE 1846

If you already have Powell Valves in your lines, you are enjoying flow control at its best. But possibly you have never tried valves engineered to meet specific service conditions under which they must operate. To find out how good valves really can be, install Powell.

The Wm. Powell Company
Cincinnati 22, Ohio



POWELL

BRONZE, IRON, STEEL AND CORROSION-RESISTING VALVES

WHATEVER THE PUMPING JOB

WHEN YOU SPECIFY

"Buffalo"

YOU'RE SPECIFYING SATISFACTION

(Photo courtesy Washington Sunday Star)

**Above, the 25' fountain produced by the No. 2 "Buffalo" SL Double Suction Pump bottom right, in Flower and Garden Show, National Guard Armory, Washington, D.C. Installation by Standard Engineering Company, Washington, D.C.*

Bottom left, SL Pumps handling chilled water in a large air conditioning installation.

It isn't every day that a "Buffalo" pump is called on to create a 25-foot fountain for a Flower and Garden Show — in fact, probably 99.99% of our pumps feed boilers, handle paper stocks or pump clear water in every conceivable commercial or industrial application.

The point is, they do those jobs well, as users can tell you.

In the "Buffalo" line, you'll find:

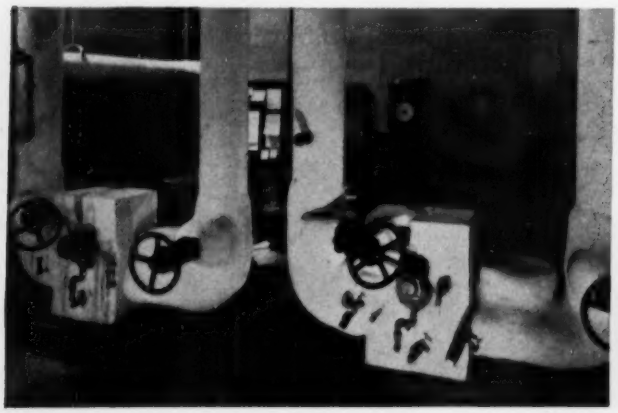
(1) *The RIGHT pump.* The line includes acid, rubber- lined, alloy, double-suction, single-suction, multistage, close-coupled, diagonally or horizontally split-shell, for almost any conditions.

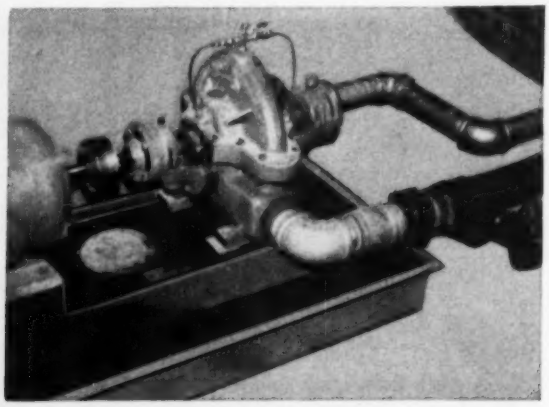
(2) *Efficiency — long life.* Impellers are husky, efficient enclosed type, and liquid passages are formed for least resistance.

(3) *Easy maintenance.* All parts are readily accessible, including impellers, stuffing boxes and bearings.

To be doubly sure that each "Buffalo" pump will perform up to specification on the job, it must pass a load test before shipment, duplicating the actual hydraulic conditions of the job for which it is intended.

Why not put a "Buffalo" pump on your next job — for permanently satisfactory results? Write for details.





"Buffalo"

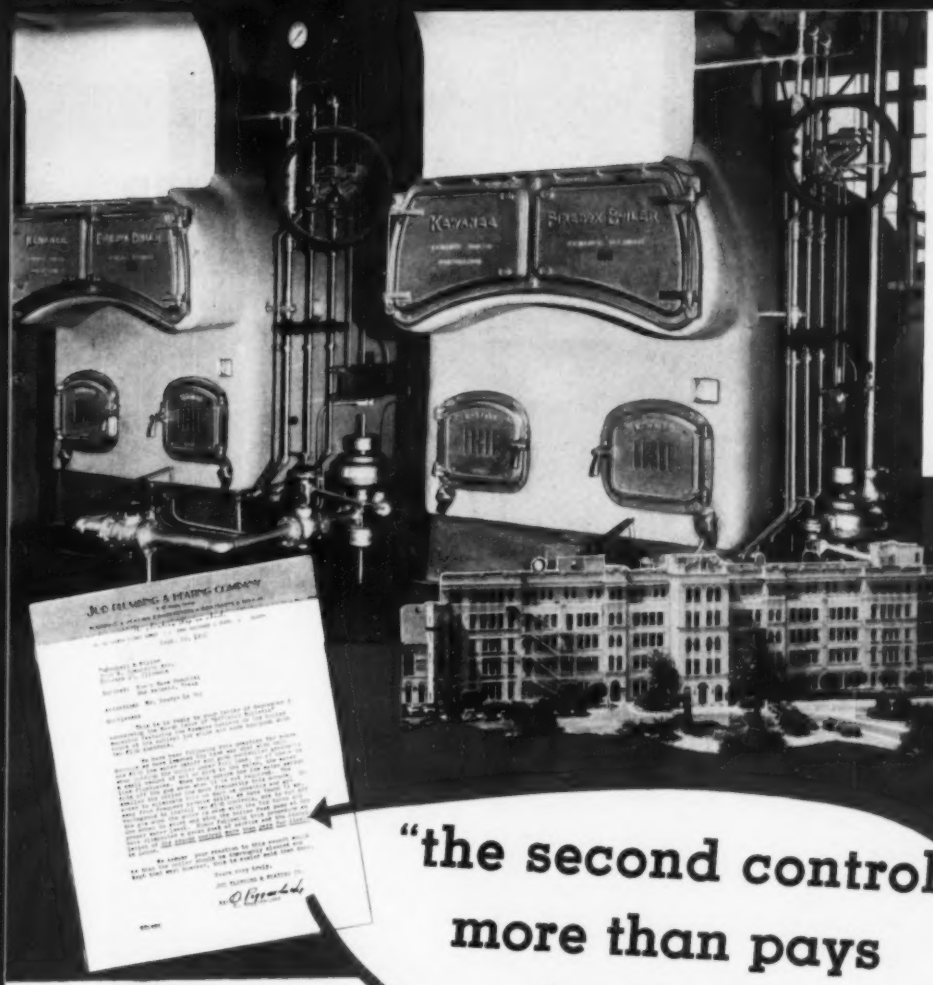
BUFFALO PUMPS, INC.

171 MORTIMER STREET BUFFALO, N. Y.

Subsidiary of Buffalo Forge Company

Canada Pumps, Ltd., Kitchener, Ont. Sales Representatives in all Principal Cities

A BETTER CENTRIFUGAL PUMP FOR EVERY LIQUID



SANTA ROSA HOSPITAL
San Antonio, Texas

Architect:
Phelps, Dewees & Simmons

Engineer:
Gerard M. Baker

Heating Contractor:
Jud Plumbing & Heating Co.

"the second control more than pays for itself"

HERE you see the utmost in boiler water level control keeping excellent company. Those No. 150 Pump Controllers and Low Water Cut-offs are installed on two large modern Kewanee firebox boilers in the boiler room of a big new addition to San Antonio's already large and famous Santa Rosa Hospital.

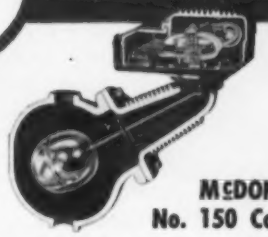
The men and firms who turned out this commendable job are listed above. An interesting aspect of the engineering is the use of two McDonnell No. 150 Controls on each boiler; one positioned higher than the other; the upper control used solely to control the feed pump; the lower, solely as a low water cut-off to stop the gas burner.

In a letter from the heating contractor, the reason for this arrangement was given: When the controls were installed, it was decided that local conditions would produce considerable fluctuations in the boiler water level which would often cause the low water cut-off switch to stop the burner when there was no actual condition to warrant cutting off. By setting the low water cut-off so that it will stop the burner only when there is a serious low water condition, unnecessary service calls are avoided. As a result, says the letter, "the second control more than pays for itself."

The resourcefulness to meet special conditions in a practical way is characteristic of men who know their heating and equipment. So it is not surprising to find McDonnell equipment in so many of these well engineered, capably-executed installations.

McDONNELL & MILLER, *Inc.*, 3500 N. Spaulding Ave., Chicago 18, Ill.

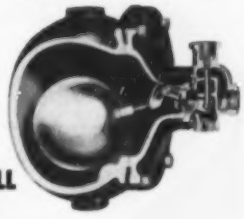
Doing One Thing Well



McDONNELL
No. 150 Control

Maximum Steam Pressure, 150 lbs.
Underwriters' Approved

Holds boiler water level within the close limits that assure maximum steaming efficiency and fuel economy. Ask for complete set of installation and wiring diagrams covering both single and battery boiler jobs.



McDONNELL
No. 27

Make-up Water Feeder

An excellent team-mate for the No. 150, this McDonnell make-up water feeder is mounted on the receiving tank to maintain a minimum water level at all times.

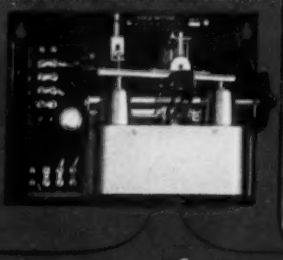
McDONNELL *Boiler Water Level Controls*

HOFFMAN TEMPERATURE CONTROLLER

For CONVECTOR, BASEBOARD and PANEL Forced Hot Water Heating Systems

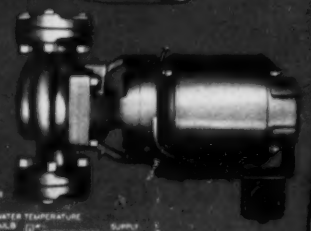
CONSTANT COMFORT ACHIEVED WITH THESE No. 900 SPECIALTIES

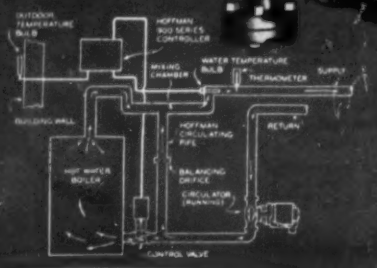
HOFFMAN No. 900 TEMPERATURE CONTROLLER

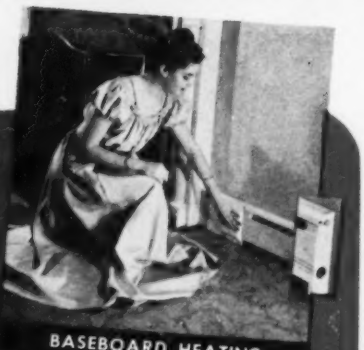


HOFFMAN D4 CONTROL VALVE

HOFFMAN CIRCULATOR

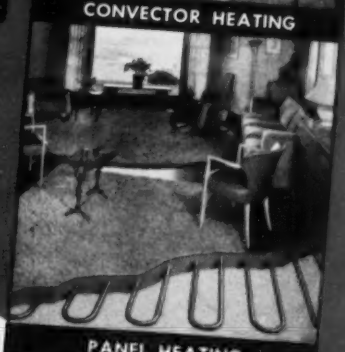






BASEBOARD HEATING

CONVECTOR HEATING



PANEL HEATING

CONTINUOUSLY CIRCULATED HOT WATER • • •

AUTOMATICALLY MAINTAINS UNIFORM COMFORT REGARDLESS OF WEATHER CHANGES

The Hoffman Temperature Controller is based on the fact that for every Outdoor Temperature there is a corresponding Supply-water Temperature, which must be *automatically maintained* in the heating units. The correct Supply-water Temperature, in the case of a panel heating system, or the output per sq. ft. EDR in the case of other forms of radiation, must be specified by the Architect or Engineer for *one Outdoor Temperature*. The Controller then *automatically* adjusts the Water Temperatures to balance any other outdoor conditions encountered. The following table illustrates several sets of conditions for a panel heating system.

Architect or Engineer to Specify			Factory Sets Controller		Controller Automatically Furnishes Supply Water at Temperatures Correct for Any Outdoor Temp. as Listed Below				
					Outdoor Temperature °F.				
Design Temp. °F.	Supply Water °F.	Room Temp. °F.	Scale No.	Supply Water °F. at Outdoor 32 °F.	−10	0	+10	+30	+50
					SUPPLY WATER TEMPERATURE °F.				
−10	150	70	11	108	150	140	130	110	90
0	150	70	13½	114	—	150	139	116	94
+10	140	70	14	113	—	—	140	117	94
−10	140	70	9	104	140	132	123	106	88
−10	160	70	13	113	160	147	137	115	92

When the outdoor temperature reaches 65°F., the Circulator automatically stops. The 65° factory setting was chosen because it is the basis for calculating degree days. If a different cut-out temperature is desired, it can be easily adjusted to individual requirements. Occasionally the actual heat loss differs from the calculated loss due perhaps to changes in construction. The Temperature Controller can be easily re-adjusted after installation according to simple, definite instructions furnished by the factory. Technical literature describing the No. 900 Controller and sample specifications, gladly furnished on request.

Applicable to every Type of Building Zoning Easily Accomplished

COMMERCIAL

INDUSTRIAL

RESIDENTIAL

• • • PIONEERED BY HOFFMAN

HOFFMAN SPECIALTY MFG. CORP. • 1001 York Street, Indianapolis 7, Indiana

Makers of Valves, Traps, Hot Water Heating Systems, Vacuum and Condensation Pumps — Sold by Leading Wholesalers of Heating and Plumbing Equipment

for better drainage lines

CHASE COPPER TUBE

CHASE

Smooth inside surfaces assure even flow!

Corrosion-resistant, of course!

Entire system lightweight, easily installed!

Fittings trim and compact!

CHASE Copper Fittings are water-tight, pressure-tight!

Chase Copper Tube with Chase Solder-Joint Fittings for waste, vent and soil lines can be installed rapidly . . . more economically...do a better drainage job . . . last longer.

You get a *lightweight system* that can be easily assembled and handled on the job. Pipe and joints are rugged enough to take hard knocks. 20 foot lengths need fewer joints.

For complete information, see your Chase wholesaler.

Chase BRASS & COPPER

WATERBURY 20, CONNECTICUT • SUBSIDIARY OF KENNECOTT COPPER CORPORATION

The Nation's Headquarters for Brass & Copper

Albany†	Cleveland	Kansas City, Mo.	New York	San Francisco
Atlanta	Dallas	Los Angeles	Philadelphia	Seattle
Baltimore	Denver†	Milwaukee	Pittsburgh	Waterbury
Boston	Detroit	Minneapolis	Providence	
Chicago	Houston	Newark	Rochester†	(† sales office only)
Cincinnati	Indianapolis	New Orleans	St. Louis	

RUGGEDLY BUILT

for LOW-COST SERVICE

DESIGNED TO MEET MODERN INSTALLATION, SERVICE AND INVENTORY DEMANDS, TACO CIRCULATORS PROVE TOP DOLLAR VALUE

EXCLUSIVE FEATURES SPELL QUALITY CONSTRUCTION

LARGE POWERFUL MOTOR. Has power to spare. Overload protected and resiliently mounted for quiet operation.

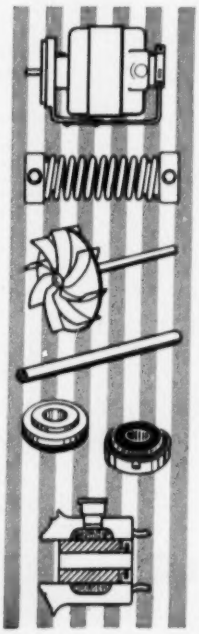
STRONG FLEXIBLE DRIVE SPRING isolates impeller from motor for quiet vibrationless operation.

CAST BALANCED IMPELLER (Not stamped). Casting the impeller in one piece makes certain of long uninterrupted service.

HARDENED GROUND STAINLESS STEEL SHAFT. Made to a plus tolerance of zero and minus tolerance of .0004. Then superfinished for long life smooth operation.

PATENTED ROTARY SEALS. Highest quality rotary seals make for trouble free operation.

POROUS BRONZE BEARING-LARGE OIL RESERVOIR. Long porous bronze bearing lubricates impeller shaft while keeping it in perfect alignment.



Contractors and big users alike are enthusiastic about the new Taco Circulators — and with good reason. This big-value line is specifically designed to meet the needs of the heating market of *today:*

Extra capacity for small pipe radiant heating jobs — radiator, convector, baseboard or panel. Just one size circulator to stock and use — with ¾", 1", 1¼" and 1½" interchangeable flanges to handle any job.

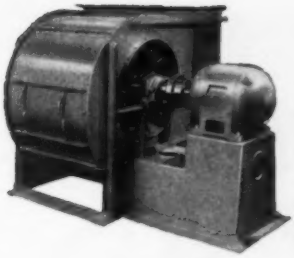
Easy to service — seals replaced with only an open end wrench, screwdriver and Allen set screw wrench. Quiet — no velocity noises regardless of flange size. Designed for six position installation, the new Taco circulator comes in special window carton with flanges individually packed for quick changing.

Better Heating-Better with Taco

TACO HEATERS, INCORPORATED, 137 SOUTH STREET, PROVIDENCE 3, R. I.

MAIL THIS COUPON

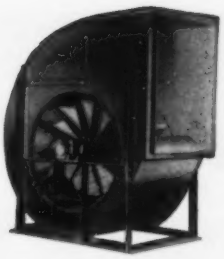
for engineering information to help you pick the BEST FAN for your JOB



DRAFT FANS

"Buffalo" mechanical Draft Fans are helping turn out low-cost steam in plants and major utility stations everywhere.

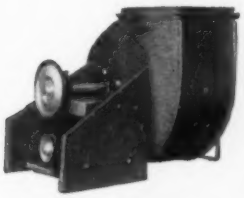
BULLETIN 3750



LIMIT-LOAD FANS

"Buffalo's" most widely used ventilating and air conditioning fans. 600 to 500,000 cfm capacities. Quiet, non-overloading, efficient.

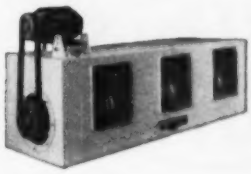
BULLETIN 3737



BELTED VENT SETS

Non-overloading ventilating fans for duct or free air delivery. Extra quiet.

BULLETIN 3720



SHORTBOY VENTILATING SETS

Quiet, efficient, vibration-free fans. Wheels mounted on hollow shaft.

BULLETIN 3701

BUFFALO FORGE COMPANY

171 MORTIMER STREET BUFFALO, N. Y.

Gentlemen:

I have looked over the checklist of quality "Buffalo" Fans on this page. Please mail me Bulletins Nos. _____

NAME _____

FIRM _____

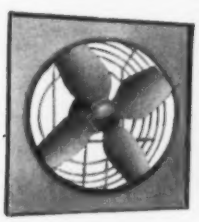
ADDRESS _____

P.S. I would also like information on the line of "Buffalo" Centrifugal Pumps. The job I have in mind would have the following hydraulic conditions:

_____

_____

_____



New! NV-BREEZO FANS

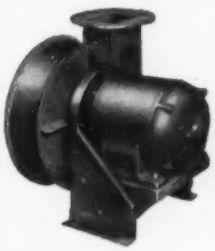
Their specially-shaped four-blade wheel gives high efficiency even against system pressures of ¼" and ½". 8" to 24" sizes.

BULLETIN 3865

New! BELT-AIR FANS

Quiet, sturdy fans to move a lot of air at negligible cost. Heavy-gauge die-stamped blades and panel.

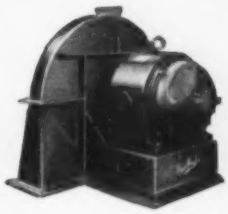
WRITE FOR BULLETIN



"CB" PRESSURE BLOWERS

Up to 2¼ psi, single stage with these husky, space-saving units!

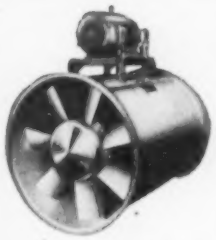
BULLETIN 3553



"CC" PRESSURE BLOWERS

In sizes for up to 4 psi, and capacities up to 75,000 cfm. Complete range of sizes, extra heavy-duty construction.

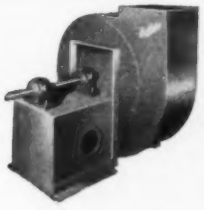
BULLETIN 3553



AXIAL FLOW FANS

Compact, light, highly efficient ventilating fans for light duty.

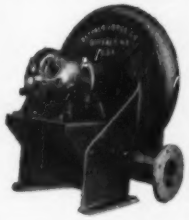
BULLETIN 3533



INDUSTRIAL EXHAUSTERS

All-welded for strength and high efficiency. With air or material wheels.

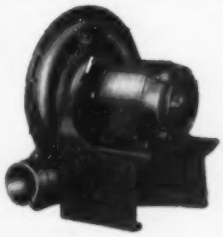
BULLETIN 3576



"RE" BLOWERS - EXHAUSTERS

For pressures up to 40" of water; 50 to 1600 cfm. Furnace blowing, line boosting.

BULLETIN 3014



"E" BLOWERS - EXHAUSTERS

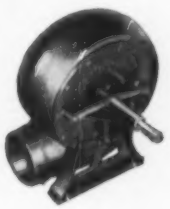
For low to medium pressures and volumes in draft, cleaning, line boosting.

BULLETIN 3014

BABY CONOIDAL FANS

Adjustable discharge, compact design, multi-blade rotors make these fans ideal for many small jobs.

BULLETIN 3576



VOLUME FANS

Rugged blowers-exhausters with cast iron housings and dust-proof ball bearings for any job up to 10" s.p.

BULLETIN 3615

Where *CONTINUOUS FLOW AND*

Zurn LPD Duplex Gate-Type Strainers in common with other types provide continuous flow of liquids. These Strainers can be used for all liquids. Zurn Engineered LPD Strainers are designed to provide the answer to costly shut downs.

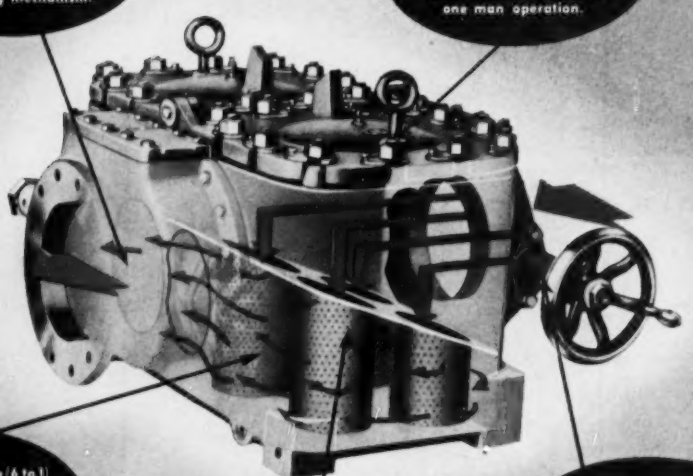
ZURN

DUPLEX GATE-TYPE

LPD STRAINERS

Free Floating Valve Disk, easily removed through the valve access cover, insures against binding of valve operating mechanism.

Hinged Cover with "C" Washer Closure and Multiple Basket design facilitates cleaning; permits one man operation.



Zurn LPD Duplex Gate-Type Strainers can be used for all fluids. *They permit high rates of flow with remarkably low pressure drop and immeasurably improve the handling of fluids.*

Large open area ratio (6 to 1) lengthens cleaning cycle relative to conventional style 2½ or 3½ to 1 open area ratio strainers.

Angle Basket design permits straight-through flow, minimizes pressure drop.

Operating Screw cannot be damaged by corrosion or foreign particles in the liquid on the inside or by physical damage on the outside of the strainer.

MAXIMUM CAPACITY are required, use

ZURN DUPLEX GATE-TYPE LPD STRAINERS

Design improved for placement of Multiple Catch-Baskets. *This permits straight-through flow which minimizes pressure drop.* Angle Basket design insures complete retention of strained particles when basket is being removed for cleaning. *One man can complete basket cleaning easily, rapidly and at low cost.* Basic face-to-face and centerline-to-base dimensions are favorable for installation in minimum space.

Like all other Zurn LPD Strainers, Duplex Gate-Type Strainers are held at close tolerances for materials, shapes and dimensions assuring the utmost in strength and safety and continuous operation.

Zurn LPD Strainers are widely used to protect close-tolerance control devices and delicate mechanisms, also to protect product purity. They make continuous production processes possible. Zurn Fluid Handling Engineers are available for consultation on your particular problem. Write or wire direct to factory.

J. A. ZURN MFG. CO.

INDUSTRIAL DIVISION • ERIE, PA., U. S. A.

In Canada: Canadian Zurn Engineering Ltd., Montreal 25, P. Q.

There is a ZURN LPD Strainer for every fluid handling purpose

Zurn LPD Duplex Strainer, Plug-Type.

Zurn LPD Sinlex Strainer available in offset and straight-through types.

Zurn LPD "Y" Type Strainer available in any cast material and for high pressures.

Zurn LPD Sinlex Strainer, Multiple Basket Type, available in several metals and for high temperature installations.

Zurn LPD Strainer applications include fluid handling lines for lubricating and fuel oil, and oil during the refining process; a wide range of chemicals produced and used by the various process industries; public utility power plants; power stations; industrial plants; ships and high temperature installations. Zurn Fluid Handling Engineers are available for consultation.

Zurn Engineered Low Pressure Drop Strainers are patented and patents pending.

Copyright 1953

WRITE FOR ZURN LPD STRAINER DATA MANUAL NO. 952

This Manual includes *previously unpublished pressure drop data* and gives useful, factual information on fluid handling.

J. A. ZURN MFG. CO.
Industrial Division, Erie, Pa., U. S. A.

Please send me Zurn LPD Strainer Data Manual No. 952.

Name .....

Position .....

Company .....

Street .....

City and State .....

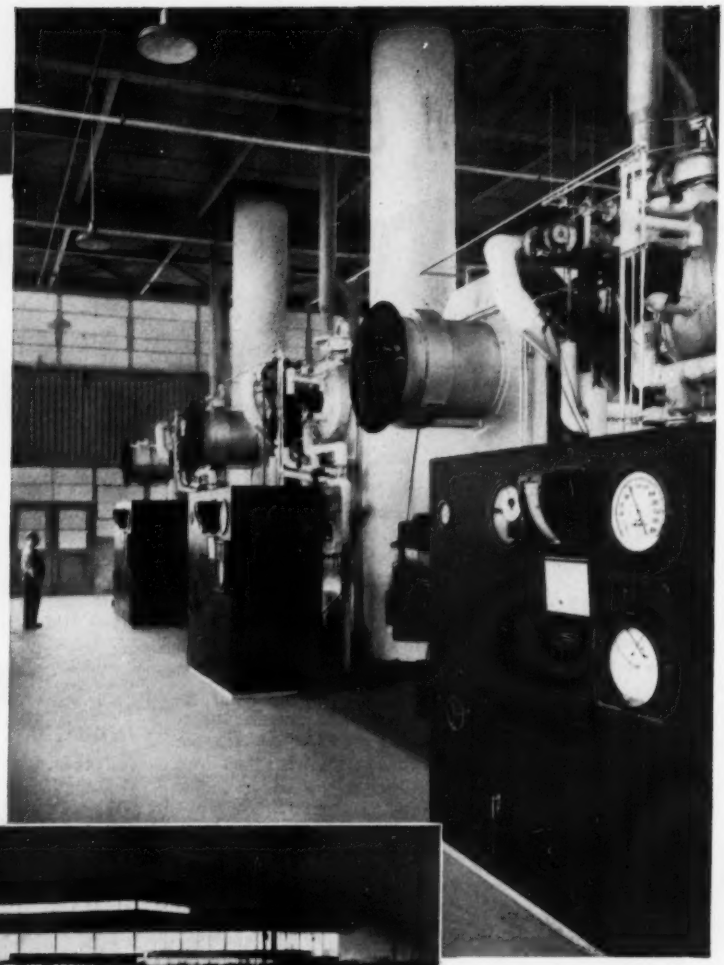
Please attach coupon to your business letterhead.
Dept. HPAC.

keeping steam cheap . . .

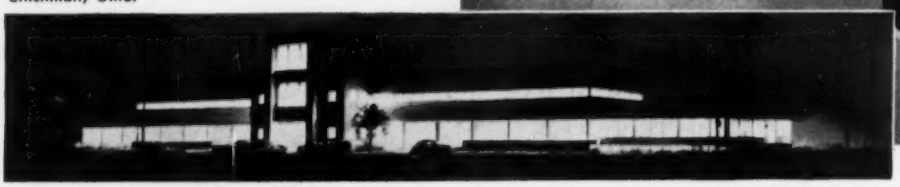
with a multiple-unit installation

at

WHITE LABORATORIES, INC.



Night view of new White Laboratories plant—
A. M. Kinney, Inc., Consulting Engineers,
Cincinnati, Ohio.



- Saves Erection Time and Cost
- Meets Wide Range of Service
- Handles Quick Load Changes
- Fast Steaming
- Low Maintenance
- Easy Accessibility
- Suitable for Outdoor Service
- Burns Oil and/or Gas
- Saves Fuel
- Saves Space
- Safe, Automatic Operation

Installation of 3 B&W Integral-Furnace Boilers, Type FM, to serve the steam requirements of the large, modern plant of White Laboratories, Inc. at Kenilworth, N. J., is one more indication of the industry-wide acceptance trend now firmly established by these shop-assembled, B&W Units. Choice of this multiple-unit application of FM boilers instead of a single, larger unit, was decided on after careful consideration of all the factors involved in designing this new, expanded plant to provide a solution to White's continuing space problem. Each of these compact, versatile B&W Units is oil-fired by a B&W Y-Jet oil burner equipped with steam atomizer, and each is capable of producing 23,800 lb of steam per hr at pressures to 235 psi.

Combining the benefits of "package" steam with cost-saving big boiler advantages, B&W's Integral-Furnace Boiler, Type FM, has already been selected for a variety of companies covering more than 50 different industries as well as utilities and other users. B&W Units having a total steam capacity of more than 6½ million lb per hr are now in service or on order. Over half of this total capacity consists of multiple-unit installations. Available in standard sizes for loads ranging between 2900 and 28,000 lb per hr at steam pressures between 15 and 235 psi, this self-contained B&W steam generator is also obtainable for operation at higher pressures.

Send for Bulletin G-76 describing and illustrating the many cost-saving features of this popular boiler. The Babcock & Wilcox Company, Boiler Division, 161 East 42nd St., New York 17, N. Y.

BABCOCK & WILCOX

G-594

THE EDITOR'S PAGES

ST. LOUIS ELECTS AS ITS NEW MAYOR Raymond R. Tucker, professor of mechanical engineering on leave from Washington University. Professor Tucker was smoke commissioner of St. Louis some years ago. He wrote an extensive series of articles for Heating, Piping & Air Conditioning giving complete details on that city's smoke elimination program, which were published back in '46 and '47

DURKIN TO SPEAK AT HPACCNA CONVENTION

SECRETARY OF LABOR Martin P. Durkin will be the featured speaker at the 64th annual convention of the Heating, Piping and Air Conditioning Contractors National Association, according to the Chicago convention committee chairman, Joseph S. Kearney.

The four-day meeting at the Edgewater Beach hotel, May 13-16, is expected to be of record size, with representatives of the association's 1200 contracting firms from 40 local associations gathered to report and discuss the latest developments of interest to their billion-dollar industry.

Mr. Kearney reports that other prominent speakers to address the group include Fred Smith, vice president of the Wm. Powell Co., whose topic will be The Importance of Personality in Selling; Albert J. Nesbitt, president of John J. Nesbitt, Inc., who will speak on Relations Between Contractors and Manufacturers; Clarence Manion, former dean of law at Notre Dame, whose subject will be The Constitution Is Your Business; and Peter T. Schoemann, acting general president of the United Association of Journeymen and Apprentices of the Plumbing and Pipe Fitting Industry of the United States and Canada.

Activities of the HPACCNA during the past year will be reviewed, and plans will be made for the coming year, said president William W. Murray, Jr., head of Almirall & Co., New York.

Recipient of the distinguished service award this year will be Raymond D. Berry, president of Gallaher & Speck, Inc., prominent Chicago mechanical contracting firm, for rendering "distinguished service to the association and its members by developing better labor management relations, by contributing to the growth of apprenticeship, by collaborating nationally and locally in the development and use of standards, and in the establishment of economic methods of control of pipe welding."

VOTE TO MERGE REMA, ACRMA TO FORM ARI

MERGER OF THE Refrigeration Equipment Manufacturers Association (REMA) and the Air Conditioning & Refrigerating Machinery Association (ACRMA) was approved by the boards of directors of both associations at recent meetings. George S. Jones, Jr., former vice president in charge of sales for Servel, Inc., will head the organization as managing director.

The new organization is to be known as the Airconditioning and Refrigeration Institute (ARI). Headquarters will be combined and remain in Washington. The combined membership will exceed 150 firms.

One objective of the merger is "to gain recognition as the official voice of the mechanical cooling industry in all its relationships with other trade associations, the government, the press and the public."

NEW REFRIGERATION GROUP HOLDS FIRST MEETING

THE NEWLY FORMED Refrigeration Trade Association of America held its first annual convention in Washington, D.C., in March. Major business accomplished was the drafting and adoption of its constitution, though the three-day affair included a number of technical talks and social events.

The RTA was incorporated in the District of Columbia last May and now includes approximately 150 members. The five local chapters are in Baltimore, Montgomery, Ala., Richmond, Va., Washington, and Winston-Salem, N. C. Formed to embrace "the entire refrigeration and air conditioning field", membership is open to servicemen, mechanics, contractors, wholesalers, manufacturers and other refrigeration associations. The headquarters office is at 3531 14th St., N.W., Washington 10, D. C.

Stated objectives of the association are said to include: "the betterment of the position of the mechanic, contractor, and other essential elements of the industry by uniting under one banner, and through this, the establishment of trade recognition; the education of its members and the public in the advancement, improvement and uses of refrigerating and air conditioning devices and machinery; the licensing of refrigeration and air conditioning contractors and mechanics wherever and whenever such action would prove beneficial on the local and national level."

RTA, its officers say, does not have as its purpose the organization of labor unions but it does believe that where a situation exists pointing toward the establishment of a refrigeration labor union, regardless of the affiliation or status of the proposed formation, the union should be made up of, sponsored by, controlled by and administered by local refrigeration men.

Residential air conditioning and how RTA members can cooperate with warm air heating dealers doing this work came in for a good deal of discussion at the meeting. Speakers included T. S. Pendergast, of Tecumseh Products Co., and Frank Hudik, president, Comfortair Co., heating, ventilating, and air conditioning contracting firm of Hackensack, N. J.

The newly elected president of the

NEW TEST CODE FOR AIR FILTERS

A comprehensive article on the Air Filter Institute's code for testing air cleaning devices is scheduled for next month's issue of Heating, Piping & Air Conditioning. The first of the code's three proposed sections — devoted to "panel" or "unit" type air filters — was adopted by the AFI earlier this year. The article will describe the test procedure, objectives of the code, the standardized air cleaner test dust, preparing the performance report, etc.

association is C. W. Phillips, of the National Bureau of Standards.

SEES TOO MUCH EMPHASIS ON ROOM UNIT POTENTIAL

THE GREATEST GROWTH potential in the air conditioning field is the year 'round air conditioning of residences, with systems for industrial plants being a close second in importance, said Cloud Wampler, president of the Carrier Corp., in an address last month before the Cleveland Society of Security Analysts.

"Entirely too much emphasis is today being placed on room air conditioners as making up the bulk of the industry's potential," he said. "I am sure that year 'round units for homes will rapidly overtake room air conditioners in dollar volume. And the broad base of the business — so-called big installations — is continuing to expand at a highly satisfactory rate.

"Over the years I do not expect room air conditioners to account for more than 10 to 20 percent of the industry's total volume," he said. "On the other hand, year 'round air conditioning for homes should, within the next 10 years, become the greatest single part of the business, amounting to about 35 percent of total industry sales."

Total 1953 retail sales of the air conditioning industry may well approach the $2 billion mark, he stated, and pointed out that this would mark an increase of more than 50 percent over the estimated retail volume of $1¼ billion for the industry in 1952. Last year, in turn, showed a gain of 25 percent over the $1 billion retail sales figure for the year 1951.

"QUOTE"

"Industry is finding out every day that good working conditions are essential if it is to attract workers in the first place and keep them in the second. Air conditioning, better lighting and improved ventilation are but a few of the general applications of electric power which can help industry with this problem."—JAMES H. JEWELL, vice president, Westinghouse Electric Corp., at last month's sales conference of the Edison Electric Institute.

Mr. Wampler explained that these figures include all types of air conditioning equipment — for plants, office buildings, hotels, apartment houses, stores and homes, as well as room air conditioners — plus the cost of installation.

"HEAT ATTACK EQUALS HEART ATTACK"

"HEAT ATTACK equals heart attack" is the message of a movie now available to schools, libraries and community organizations through distributors and dealers of the Mitchell Mfg. Co., 2525 N. Clybourn Ave., Chicago. It is based on "facts authenticated by the Mitchell air conditioning research foundation in special experiments at Michael Reese hospital, Chicago."

The movie explains that the human body is a heat machine that must throw off Btu's. When the thermometer reaches the 80's and 90's, the heart pumps harder than it does normally to help the body get rid of its heat — a process that goes on during every month of a hot summer.

UNDERGROUND WATER COOLS NEW HOSPITAL

A UNIQUE ALL-YEAR air conditioning system utilizing radiant energy and subterranean water is a feature of an ultra-modern $4½ million general hospital being completed in Glen Oaks, N. Y. — the 250 bed Long Island Jewish Hospital, a nine-story, brick, steel and stone building built on some eight and a half acres of former farm land.

During the summer, underground water at a natural temperature of 50 deg will be circulated through ceiling and wall coils to cool the rooms, while in the winter the same coils are utilized for circulation of heated water. An elaborate control system utilizes some 300 thermostats to regulate the panel heating or cooling in each of the hospital's rooms and work areas, according to Minneapolis-Honeywell engineers. In addition, the temperature of the air supplied to the rooms is further controlled by an outside sensing element that regulates air temperature in proportion to weather change. The water for the radiant panels is obtained from ordinary wells and is pumped to diffusing wells, as is standard practice on Long Island.

445 AIR CONDITIONING JOBS IN FORT WORTH LAST YEAR

RESIDENTIAL INSTALLATIONS of air conditioning during 1952 in Fort Worth, Texas, led the parade both in number of jobs installed and in total tonnage, according to figures compiled by the Fort Worth commercial department of the Texas Electric Service Co. However, the four bank installations exceeded in horsepower the 226 residential systems.

AIR CONDITIONING INSTALLATIONS during 1952 in Fort Worth

Type of installation	Number	Total Tons	Total Hp
Residential	226	1379	1814.34
Apartment house	1	52.5	72.5
Offices	62	1241	1650.21
Office buildings	3	160	212.75
Stores and sales floors	42	436	565.56
Grocery stores	8	142.50	175.25
Restaurants	26	212.50	291.50
Drug stores and pharmacies	5	43	54.60
Clinics and doctors' offices	15	131.50	167.30
Hospital	1	10	13
Hotel	1	4	5
Beauty salons	7	24	31.17
Clubs	6	146	187.25
Churches	19	498	691.77
Banks	4	1325	1944.50
Funeral home	1	13	15.83
Print shops	3	53	64.6
Laboratories	2	360	463.5
Industrial	3	32	35.58
Military	2	65	78.5
Transportation terminals	3	955	1406.5
Barber shops	2	5	6.08
Tourist court	1	8	10
Educational buildings	2	353	453.32
GRAND TOTAL	445	7649	10,410.61

Nineteen Fort Worth churches, totalling 498 tons of refrigeration, were air conditioned last year.

Average tonnage of the 226 residential installations is 6 tons; the biggest has a 48 ton capacity. The average tonnage of the 219 installations other than residential is almost 30 tons.

TO TEST AUTOMOBILE AIR CONDITIONING

ONE OF THE major tests to be conducted at General Motors' new desert proving ground 35 miles from Phoenix will be of the air conditioning for GM cars. The operations building at the proving ground is unique in that it is the first GM plant equipped with a heat pump system.

Webster Walvector with attractive cabinet-type enclosure adds a modern touch in classrooms of Garfield School.

New School Building from Old

Maywood, Ill. . . . Public school officials here have extended the usefulness of the old section of the 53-year-old Garfield School by comprehensive modernization. Outstanding feature was replacement of obsolete hot air system with Webster Walvector.

Rejuvenation of the old section of the Garfield School in 1951 involved such things as fresh, light-colored paint, sanitary asphalt floor tiles and modern, movable desks. These improvements would not have been long lasting with the obsolete duct-type hot air system. Hence, Webster Tru-Perimeter Heating and Webster Walvector were vital to the plan.

Here's what Joseph Lorenzo, Building Superintendent, has to say: "We like the new system very much. Heat is spread evenly along outside walls and under all the windows with a minimum of piping. It is much more economical than our old system." Webster Walvector stops down-drafts, provides gentle heat to all parts of the room, eliminates cold and hot spots.

The new heating installation has five zones. Webster Walvector was installed in all ten classrooms. Webster Convector Radiators were used in vestibules, corridors and all other rooms.

Interested in full details about Webster Walvector? Ask your local Webster Representative for Bulletin B-1551 or write us.

Garfield School, Maywood Ill. Old section, built about 1900, was completely rejuvenated in 1951. Heating installation by Tropf Heating & Ventilating Co., Inc., with the approval of Chiaro & Chiaro, Architects and Engineers, school architects.

Address Dept. HP-5

WARREN WEBSTER & COMPANY
Camden 5, N. J. Representatives in Principal U. S. Cities
In Canada, Darling Brothers, Limited, Montreal

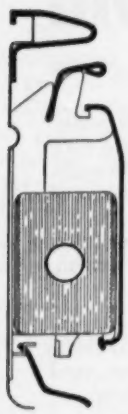
Webster WALVECTOR
REG. U. S. PAT. OFF.
For Steam or Hot Water Heating

Designed primarily for

COMFORT

with an Intelligent Artistry...

NESBITT Baseboard Radiation



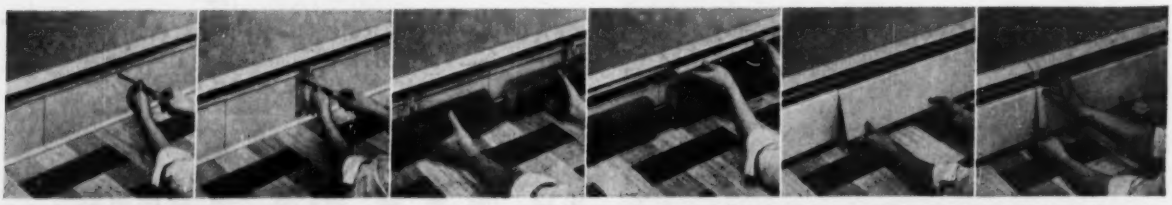
PERIMETER or baseboard radiation is not a new idea . . . but Nesbitt's approach to it is. From the vantage of long experience in the field of thermal comfort, Nesbitt set out to perfect the best possible floorline convector-radiator and then to master the matter of appearance through intelligent artistry. The result is an uninhibited product—Nesbitt Baseboard Radiation—with an adequate capacity in the fin-and-tube element (4 sq. ft. per lin. ft.) to heat the average room with only one wall length—in a streamlined enclosure that fits agreeably in any decor and appeals to the modern homemaker.

Assembled, packaged lightweight units of standard lengths are available from wholesalers, with accessories and dampers as required. Ingenious helps for easy installation, including mated tube ends for jointing without fittings, save today's most expensive commodity—time. Designers and contractors who are cost-conscious, but whose better judgment dictates "wet heat," may now find their happy answer in Nesbitt Baseboard.—*Get Publication 272.*

–and to save you money

EASY TO INSTALL

MADE BY JOHN J. NESBITT INC., PHILA. 36, PA.—SOLD EXCLUSIVELY THROUGH PLUMBING AND HEATING WHOLESALERS



1 Fasten enclosure-back to wall with screws or nails.

2 Mount the support brackets at indicated intervals.

3 Hang the assembled heating element on brackets.

4 Insert louvre blade between slots in support brackets.

5 Hang front panel on brackets, push to lock in place.

6 Attach joint trim over intersections for finishing touch.

"OPEN FOR DISCUSSION"

WE FOLLOW HERE each month the practice at engineering society meetings of providing an "open for discussion" period. You are urged to take part. Address your comments to the Editors, Heating, Piping & Air Conditioning, 6 N. Michigan Ave., Chicago 2.

EVALUATING PERFORMANCE OF AIR CLEANERS

I WAS INTERESTED in John M. Kane's review in the April HPAC of our Handbook on Air Cleaning. We appreciate the fact that this is reviewed in HPAC, and the critical evaluation offered by Mr. Kane. His comments are quite complimentary, although we included in the book certain items on which I believe there is a good deal of controversy.

Historically speaking, the field of air cleaning is quite old—yet it exists in a state today where the purchaser of air cleaning equipment is often subject to high pressure salesmanship and rather broad claims for devices. This is covered up to a large extent by the use of a statement that each and every dust, mist or fume problem in industry involves a new problem. While this may be so, in general, we recognize that there are certain fundamental types of problems and equipment. The chief difficulty has been that few people have attempted to evaluate performance of devices in the field and most evaluations have been made by the simple expedient of taking a sample of the dust and attempting to re-suspend it in the laboratory and claiming that this, therefore, is the actual performance.

The specific items on which we would take some issue with Mr. Kane are in his discussion of Chapter 3. Some of his criticism I am sure is justified, but the part which I believe can be considered most controversial is the data which we were supplied with by the manufacturers. We were well aware of this in undertaking this work for the Atomic Energy Commission and in trying to be unbiased and fair included data supplied by various manufacturers as well as data we have obtained in the field.

During the past four years, our investigations into these matters have aided the Commission in recognizing what it can expect in performance of these devices rather than accepting the general broad claims of manufacturers.

It is true that these field data represent spot checks, but so does all other such data. They certainly were obtained with what had been evaluated in the laboratory and the field as a uniform test procedure. This test procedure, incidentally, is largely based on methods which the American Society of Mechanical Engineers developed years ago. The one point to this development which we added — and we feel is very useful — is a fundamental evaluation of the particle size and dispersion characteristics of the various materials involved. We are quite aware of the effect of concentration, median particle size, temperature and other factors and feel that the information presented gives data which has not been available before.

I disagree with Mr. Kane on the fact that accurate data is difficult to obtain with small sample volumes since, in our testing procedure, we do not deal with extremely small sample volumes and in some instances our effluent samples were obtained at 70 cfm. Fundamentally, it would seem that Mr. Kane is taking issue with the concept of isokinetic sampling and its usefulness in evaluation of equipment. We have attempted, both in the laboratory and the field, to get as many studies on different types of units as possible for evaluation; but it must be recognized that a tremendous number of aerosols and dusts are involved and that such a project would involve expenditures way beyond the value of the results. For this reason, we have attempted to present data which was over a wide range of particle size and characteristics.

We cannot disagree with Mr. Kane's statement that there are many methods of measuring particle size which may influence the results. This, of course, has been the problem involved in deciding which method to use for expressing results. Whether the weight of sample, surface area, or numbers of particles are to be included in the evaluation is the fundamental question. Therefore, we were very careful in indicating the basis for the data presented. All of the sample results based on our field tests, I might add, are from direct microscopic measurement on which there is no dispute and in cases where we felt that agglomeration might result we have undertaken to use the membrane filter technique.

An interesting sidelight to the field testing is that some manufacturers were always glad to report that the devices tested were not representative, poorly maintained, recently changed in design or some other basic reason why the tests should be repeated. We can say quite confidently, however, that we would not test a device in the laboratory or field which the responsible company official did not believe was functioning properly or was not adequately installed by the manufacturer or his representative.

With regard to Mr. Kane's specific comments, we did not attempt to over-emphasize the settling chamber as a practical air cleaning device. If such were the case I think the criticism is justified. I believe that collectors such as the Howard chamber have been used in the chemical industry for several years with satisfactory results and also that laminar flow does exist in this device. I do not believe that Mr. Kane could have read the chapter on air cleaning equipment, page 17, very carefully because it is shown there that a settling chamber design as illustrated in example 2.1 shows efficiencies of 1.2 percent for particle sizes of 10 microns and an efficiency of less than 0.02 percent for sizes in the 1 micron range. Actually, my experience has been that settling chambers or traps, as they might more generally be called, are often used for removing the bulk of coarse material. As indicated at the top of page 18 of the book, one can expect that particles over 100 microns may be readily removed. The indication we made as to streamline flow within the settling chamber applied only to the Howard

type where the critical Reynolds number can be lowered to place it in the right range.

In item b of the review, again we do not agree with Mr. Kane. Our experience with the wet cell washer, as published in Industrial and Engineering Chemistry, in 1951, and other extended studies in the laboratory and in the field, have indicated that with soluble and readily wetted dusts an appreciable difference in performance can be noted. We have made some measurements on collection of stearates with the type of devices mentioned and have found that these were poor collection devices for fine zinc stearate. We do not believe that the particles are actually successfully wetted as implied by Mr. Kane. We are sure there has been impaction and agglomeration but doubt that the actual wetting of the particles has been proved. In fact, our evidence is to the contrary and apparently, the particles are still surrounded by gas films although they may have become trapped in the liquid and will often times float or froth at the top of the liquid surface in collectors. There are so many types of wet collectors employing impaction principles that the statements made as to its function in removal we believe have been substantiated by experiment and some field observations.

Under item c, again we take some issue with Mr. Kane. In laboratory tests of commercial air cleaning devices utilizing small radius cyclones (less than 3 in.) we have found significant removal of particles less than 10 microns. Down to 8 microns we have found removal at 100 percent and 90 percent removal in the 5 micron size. (See our NYO Report No. 1583).

As to item d, we think Mr. Kane is perhaps basing his opinion on some laboratory studies and not on practical field contact. We have studied and reported successful reverse jet felt cleaners operating on the Hersey principle at velocities as high as 50 fpm. Naturally, any such statements are conditioned by the particle size and loadings involved. We do not take serious issue with him on this matter. I think a ratio of 5 to 1 in the reverse jet filter over shaking bags represents a significant improvement.

Under item e, again we did not attempt to indicate broad applications for industrial air filtration with light or atmospheric loadings for the fabric arresters but merely pointed out that with filter aids it is possible to simulate the asbestos-cellulose type of filter efficiencies. When one realizes the cost and inflexibility of the latter items it becomes important to recognize this fact.

With regard to Mr. Kane's last item on maximum operating temperatures, the data we supplied was furnished by people who have had broad experience in this field. Naturally, it is to be expected that the lower the temperature that can be utilized, the longer the operating life provided by the material. I would agree with Mr. Kane in this regard, that if lower temperatures can be maintained in operation, they should be controlled to that point and certainly the lower values are desired. However, I do know that there are installations utilizing wool bags operating at the temperature stated with satisfactory results. Fundamental studies of bag life have confirmed the fact that operations at higher temperatures do reduce serviceable life.

This is a rather lengthy "rebuttal" to Mr. Kane's review. I have known Mr. Kane for a long time and I feel that he has been eminently fair in his review and we appreciate his criticisms.—LESLIE SILVERMAN, Sc. D., Associate Professor of Industrial Hygiene, School of Public Health, Harvard University.

WHAT AIR MOVEMENT IN PRINTING PLANTS?

THE MINIATURE wind tunnel method technique for actually determining acceptable air velocities in offset press rooms — described by F. F. Stevenson in the April HPAC — is a practical approach to the problem. However, temperature and relative humidity play very important parts in establishing the correct velocity for any particular project. There is no doubt that when high heat release equipment is used, higher velocities are necessary.

We have cooperated with many engineers to provide equipment for distribution of air in press rooms. The most successful are those which generally follow the pattern outlined in the April article. This suggests the use of the most efficient mixing diffusers of the aspirating six-cone type, adequate air quantities and careful location of returns.

Although the acceptable air velocities given in the article appear high as regards our own experience, we can understand that under certain conditions of temperature and radiation, 200 fpm would be acceptable to a press operator.—C. MILTON WILSON, General Sales Manager, Anemostat Corp. of America.

RETURNING CONDENSATE FROM GROUP OF BUILDINGS

I AM INTERESTED in the comments by Dick W. Whittington in the March HPAC, on returning condensate from a group of buildings. Apparently there is no variance between us concerning the desirability of having a separate vacuum pump in a large building that is relatively distant from the boiler room.

Neither of us knows where the plant referred to in my article is located nor do we know the cost or difficulty of running a separate pressure condensate main all the way back to the boiler room. I had in mind one of the Illinois state institutions having 12 separate buildings connected by narrow, crowded pipe tunnels and originally served by a reciprocating steam driven vacuum pump in the boiler house. A new building was added at the end of the campus most remote from the boiler plant, and about 2500 ft from the boiler plant measured along the tunnels.

No appropriation was available for a new pressure return pipe all the way back through the old narrow, hot, tunnels and across the old basements. The old vacuum system and pump had reached its limit and could not take on the long pull from the new building. A successful result was achieved by allowing the new electric vacuum pump to discharge its air-free condensate at atmospheric pressure but without admitting air, to the old low vacuum return main through the "gadget" despised by Mr. Whittington.—SAMUEL R. LEWIS, Consulting Mechanical Engineer, and member of HPAC's board of consulting and contributing editors.

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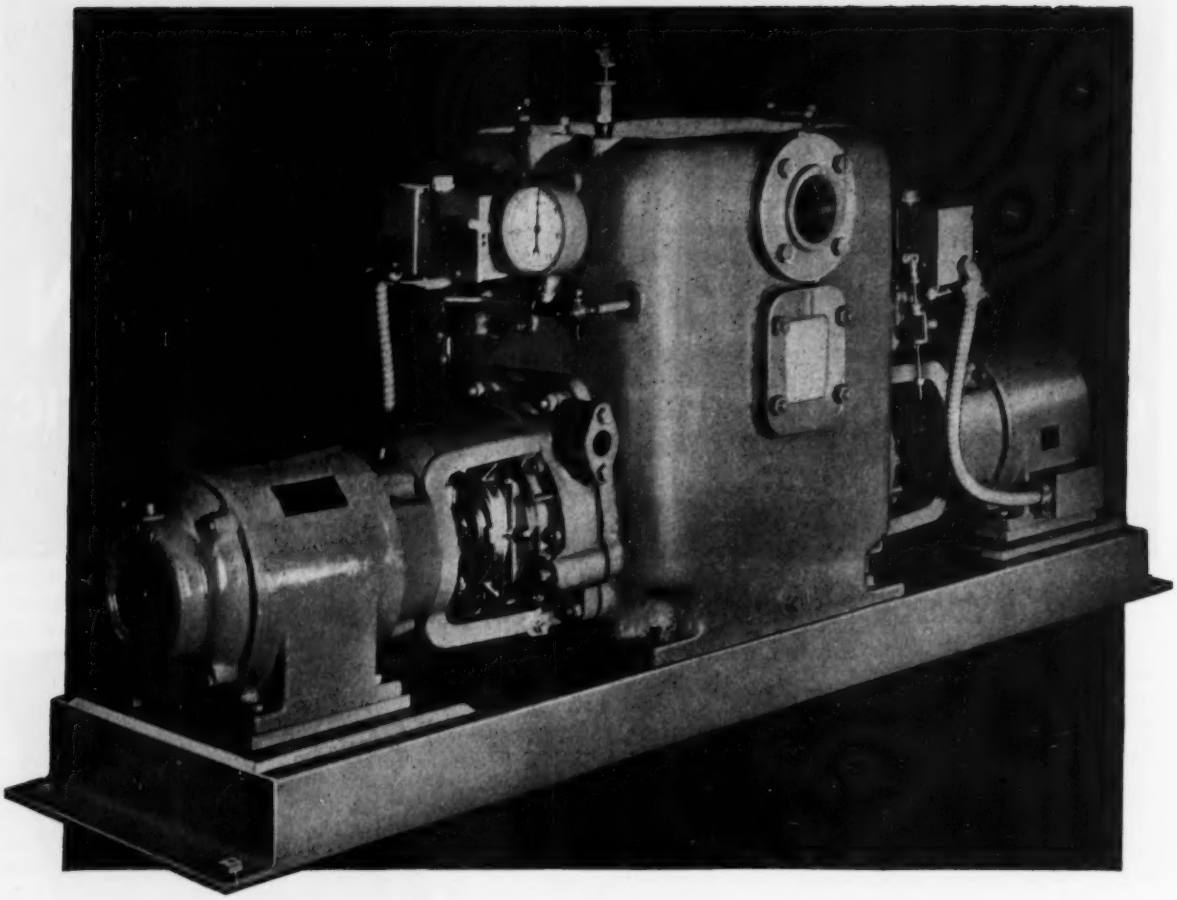

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Climatic Factors Measure Air Conditioning Potentials

In what parts of the U.S. is summer cooling most needed? In what areas are the potentials for marketing air conditioning, making cooling installations the greatest? Here's a most interesting analysis

By John R. Hertzler and V. T. Kartorie

Vice President and General Sales Manager, and Manager, Market Research, respectively York Corp.

COMMERCIAL DEVELOPMENT of year 'round air conditioning sales geographically or by territory requires sound criteria based on scientific fact to determine: (1) The areas in which development effort should be applied; and (2) to measure results actually secured in making air conditioning installations for comfort — particularly for summer comfort.

The objective is one of measuring relative *discomfort,* which in turn can be used as an index or measure of the prompting motive for the purchase of comfort air conditioning systems. It is recognized that the majority of market potential measures start with people, or population in a given area. They then progress to measure *ability to buy,* and *willingness to spend* in order to be comfortable or to enjoy a particular living standard.

Economists, in analyzing the growth of the summer air conditioning industry, have noted that the use of summer air conditioning was developed first in commercial occupancies such as stores, restaurants and office buildings [see article by Sumner Schlichter, in the November 1949 Atlantic Monthly]. Gradually, over the years, air conditioning is expected to receive much greater use in the home. Since the growth of comfort air conditioning to date has

1. **National distribution of summer air conditioning products needs a set of base criteria which can be used to measure the effectiveness of distribution and plan marketing activities.**

2. **Since people are prompted to purchase air conditioning systems for comfort by their own discomfort — both its *intensity* and *duration* — it is desirable to develop formulas for measuring those climatic factors which create discomfort.**

3. **Weather data have been analyzed and summarized and climatic factors calculated based on weighting the duration of wet bulb temperatures of 66 F or higher as the greatest single factor in the measure of discomfort. For instance, in Boston, the duration of wet bulb temperatures of 66 F and higher, in the four summer months, June through September, 24 hr per day, embraces 29.7 percent of the time. This duration weighted at 78.2 percent, design dry bulb temperature weighted at 8.3 percent, and design wet bulb temperature weighted at 13.5 percent develop an overall climatic factor which would indicate summer discomfort imposed by climate in Boston as about 35.6 percent as severe as the climatic discomfort of the state of Florida — the area of greatest summer discomfort in accordance with the studies.**

4. **The distribution of retail sales by states has been used in Fig. 3 to indicate graphically the relative importance of the states as to their need for and capacity to purchase capital goods which, in turn, could be used to develop business.**

Application of the climatic factors, as calculated, to the retail sales distribution by states makes it possible in Fig. 4 to develop a graphic portrayal of the market for commercial air conditioning for summer comfort in the United States.

Similarly, climatic factors developed by the use of degree day information for the various states makes it possible in Fig. 5 to show graphically the market for heating equipment in a relative way, using retail sales as the base.

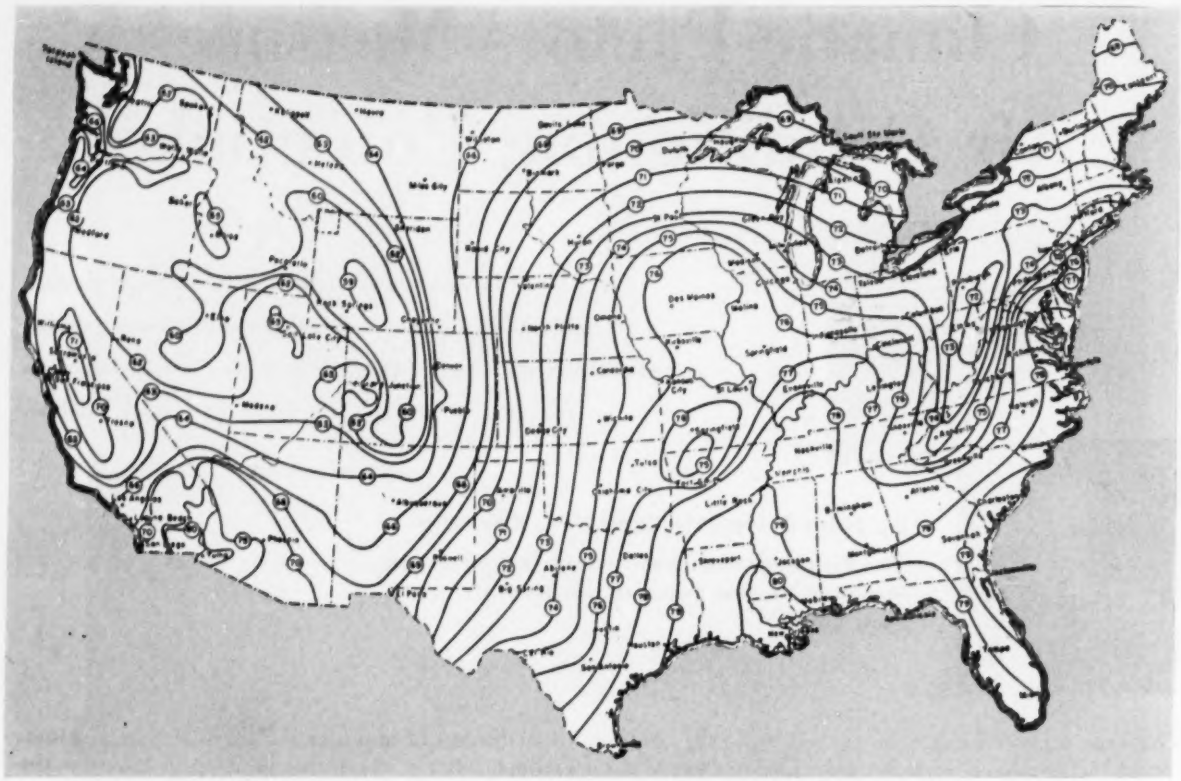

FIG. 1 — SUMMER WET BULB TEMPERATURE DATA. The wet bulb temperatures shown will be exceeded not more than 5 percent of the total hours during June through September, inclusive, of a "normal summer" (from the Engineering Manual for Industrial Cooling Towers, published by the Marley Co.)

been principally commercial, we have concentrated on the calculation of criteria for measuring the use of summer air conditioning equipment in the commercial field. This study should in turn lay fundamental groundwork for the study of the future extension of summer air conditioning to residences.

Climate Affects Air Conditioning Potentials

Sales Management magazine has provided annually an estimate of retail sales distribution by county and has used such data for the calculation of buying power indices. These indices serve remarkably well in apportioning production and sales quotas among trading areas in the United States — particularly for products that have commercial use, such as commercial refrigeration equipment. It early became apparent, however, that climate would have an important bearing on air conditioning sales development; consequently, the need was established for a series of correction or climatic factors which could be applied to the customary commercial criteria to make them applicable for use in the measurement of relative air conditioning potentials.

The degree day method of analysis has proved exceedingly accurate both for measuring relative heating potentials of various areas and for predicting fuel consumption and similar factors. Degree days when applied to summer air conditioning are not satisfactory criteria for the measurement of the relative summer air conditioning potential of territories.

One reason is that the temperature differential between the conditioned space and the outdoors is small — 15 to 20 deg, as differentiated from frequently used temperature differences for winter heating design in the range of 70 deg (particularly for the territories of high year 'round air conditioning sales.)

Another reason is that the moisture load placed on a summer air conditioning system — consisting of moisture infiltrated into the conditioned space, moisture introduced in providing outdoor air for ventilation, moisture from people, or moisture from hygroscopic materials within the space — is of greater significance in the design of summer air conditioning systems than is normally recognized. Also, the wet bulb temperature of the outdoor air is a measure of both the total heat content of the air and, to some extent, of the degree of discomfort experienced as a result of change in outdoor temperature and humidity conditions.

While it might be possible to develop a series of climatic factors based on a degree day type of analysis measured against inside desirable wet bulb temperatures versus outdoor average wet bulb temperatures, it is more important to get the exact duration of the period of discomfort by a combination analysis of dry bulb temperature and wet bulb temperature.

TABLE 1 — SEASONAL FACTORS for air conditioning

Column No. →	1	2	3	4	5	6	7	8	9
				24-HR BASIS		12-HR BASIS		8-HR BASIS	
STATE — CITY	Degree Hour Zone[a]	Design Dry Bulb Temp., F[b]	Design Wet Bulb Temp., F[b]	Wet Bulb 66 F and Above, in Hours[c]	Seasonal Factor F_s	Wet Bulb 66 F and Above, in Hours	Seasonal Factor F_s	Wet Bulb 66 F and Above, in Hours[c]	Seasonal Factor F_s
ALABAMA — Mobile	3	95	80	2752	747	1379	409	931	299
ARIZONA — Phoenix	3	105	76	1847	526	1045	326	725	246
ARKANSAS — Little Rock	1	95	78	2524	694	1299	388	879	283
CALIFORNIA — Fresno	2	105	70	642	222	528	193	362	152
Laguna Beach	5	90*	70*	238	117	174	101	166	99
Oakland	1	85	65	24	60	19	59	17	58
San Diego	4	85	68	884	276	525	186	404	156
Williams	2	100*	72*	681	251	613	214	508	138
COLORADO — Denver	1	95	64	32	64	23	62	22	61
Grand Junction	1	95	65	48	68	37	66	28	64
CONNECTICUT — Hartford	1	93	75	1148	348	752	249	592	209
DISTRICT OF COLUMBIA — Washington	1	95	78	2043	574	1111	341	751	251
FLORIDA — Jacksonville	1	95	78	2857	772	1439	423	963	304
Miami	1	91	79	2914	791	1464	428	976	306
GEORGIA — Atlanta	1	95	76	2396	661	1245	373	864	278
IDAHO — Boise	2	95	65	96	80	88	78	40	66
ILLINOIS — Chicago	1	95	75	1158	351	643	222	479	181
Moline	2	96	76	1450	425	814	266	602	213
INDIANA — Evansville	2	95	78	2060	578	1102	338	772	256
KANSAS — Wichita	1	100	75	1863	528	1047	324	729	245
LOUISIANA — New Orleans	2	95	80	2817	768	1432	422	960	304
Shreveport	1	100	78	2615	718	1346	401	917	293
MASSACHUSETTS — Boston	1	92	75	870	278	524	192	380	156
MICHIGAN — Detroit	3	95	75	1038	321	676	230	472	179
MINNESOTA — St. Paul	3	95	75	914	290	552	199	379	156
MISSISSIPPI — Jackson	1	95*	79*	2619	718	1345	400	916	292
MISSOURI — Kansas City	1	100	76	1910	541	1054	352	697	237
Kirksville	1	95*	78*	1597	462	878	282	680	253
St. Louis	1	95	78	1852	521	1008	315	701	258
Springfield	2	98*	78*	2060	579	1106	340	786	260
MONTANA — Helena	1	95	67	12	60	12	60	12	60
NEBRASKA — North Platte	3	95	78	899	288	617	217	476	182
Omaha	1	95	78	1654	475	947	300	657	222
NEVADA — Reno	1	95	65	10	59	10	59	6	58
NEW JERSEY — Camden	2	95	78	1460	428	780	258	606	214
Newark	1	95	75	1440	421	817	266	569	204
NEW MEXICO — Albuquerque	1	95	70	140	94	123	90	117	88
NEW YORK — Albany	2	93	75	739	246	479	181	343	147
Buffalo	2	93	73	700	235	390	157	314	138
New York	3	95	75	1464	427	854	270	602	212
NORTH CAROLINA — Raleigh	2	95	78	2313	641	1229	370	819	268
Wilmington	1	95	78	2580	708	1328	395	880	285
OHIO — Cincinnati	2	95	78	1742	498	1028	329	693	239
Cleveland	1	95	75	1080	351	724	245	482	182
OKLAHOMA — Tulsa	2	101	77	2357	653	1255	378	857	278
OREGON — Portland	2	90	68	162	97	161	97	51	69
PENNSYLVANIA — Bellefonte	2	95*	75*	892	284	625	218	444	172
Pittsburgh	2	95	75	1059	326	673	230	479	181
SOUTH CAROLINA — Charleston	2	95	78	2708	740	1393	411	932	296
SOUTH DAKOTA — Huron	1	95	75	776	255	460	176	372	154
Rapid City	2	95	70	240	119	192	107	140	94
TENNESSEE — Knoxville	1	95	75	2201	612	1156	350	790	259
Memphis	2	95	78	2401	663	1242	375	849	275
TEXAS — Amarillo	2	100	72	1050	324	689	233	624	217
Brownsville	7	100	80	2912	793	1463	431	975	309
Dallas	4	100	78	2615	718	1331	397	912	292
El Paso	1	100	69	809	262	537	194	458	174
Houston	5	95	78	2824	769	1424	419	948	300
San Antonio	4	100	78	2767	756	1402	415	936	298
UTAH — Modena	1	95	65	8	58	7	58	5	58
Salt Lake City	2	95	65	36	65	78	76	56	70
WASHINGTON — Seattle	1	85	65	92	77	32	62	24	60
Spokane	2	95	65	15	60	15	60	8	58
WISCONSIN — Green Bay	1	95	75	769	254	436	170	325	143
La Crosse	2	95	75	1123	342	665	228	479	181

[a]Corresponds to degree-hour zones in Table 2 and Fig. 2.
[b]Source: 1951 ASHVE Guide, pp. 261-264. Items marked * not included in ASHVE Guide.
[c]Source: Summer Weather Data, Marley Co., 1939, 1944; pp. 66-71 incl.

Design Dry Bulbs, Wet Bulbs Index of Discomfort

Design dry bulb and wet bulb temperatures as recommended for use in the design of summer air conditioning systems by the American Society of Heating and Ventilating Engineers' Guide give an index of the *intensity* of discomfort in the summertime. U. S. weather records similarly supply a measure of the *duration* of the summer discomfort. It becomes necessary, however, in calculating a given index of discomfort resulting from the summer weather, to determine what weighting to apply to design dry bulb temperature, design wet bulb temperature, and duration of the summer air conditioning season during which cooling and dehumidification is necessary to provide comfort.

Such a climatic factor can only be relative and but one of a number of criteria used to determine the comparative air conditioning potentials of areas such as (for example) Boston compared with Houston. The arbitrary weightings applied in these studies were:

a) Design dry bulb temperature in degrees Fahrenheit × 1,

b) Design wet bulb temperature in degrees Fahrenheit × 2,

c) Number of hours for the months of June, July, August and September (24 hr per day basis) when the wet bulb temperature equals or exceeds 66 F.

The seasonal factor, F_s, for each temperature zone was defined as one-fourth the sum of: (design dry bulb) + (2 × design wet bulb) + (number of hours, June through September with wet bulb of 66 F or above.)

Judgment and experience in the design of summer air conditioning systems in various parts of the country prompted the weighting of design wet bulb temperature twice the weighting of design dry bulb.

Duration of Cooling Season Important Factor

Duration of the summer season has been such an important factor in the purchase of air conditioning systems that it was determined to use the actual number of arithmetical hours when some form of cooling and dehumidification by external means would be required.

Of the 2928 hours in the four summer months, the book Summer Weather Data [published by the Marley Co., Inc., Kansas City, Mo., in 1939] gives 2824 hours of wet bulb temperatures 66 F and above for Houston compared with 870 hours for Boston. Thus, the Houston apparent operating season is 3¼ times the duration of the Boston season and covered 96.5 percent of the four summer months, whereas the Boston season of weather 66 F wet bulb or higher is about 30 percent of the four summer months.

The Comfort Chart, Fig. 10 in Chapt. 6 of the 1951 ASHVE Guide, would seem to indicate that a base wet bulb temperature equivalent to 71 deg effective temperature might be used. For a 50 percent relative humidity, the wet bulb temperature usable for measurement of the duration of the cooling season might be lowered to 63 or 64 F; however, the qualifications relative to the use of Comfort Zone data are such that it is believed a level of 66 rather than

TABLE 2 — CLIMATIC FACTORS. Seasonal factor F_s = ¼[(design dry bulb) + (2 × design wet bulb) + hours wet bulb exceeds or equals 66 F during June through September in 24 hr day]

State	Degree Hour Zone	Col. 1 Design Dry Bulb Temp. F	Col. 2 Design Wet Bulb Temp. F	Col. 3 Hours in 24 Hr Day Wet Bulb Is 66 F or Over	Col. 4 Seasonal Factor (See formula in heading)	Col. 5 Climate Factor F_R = F_s/782
ALABAMA	1	95	78	2400	663	0.848
	2	95	79	2600	713	0.912
	3	95	80	2732	747	0.955
State Average						0.876
ARIZONA	1	90	65	140	90	0.115
	2	95	70	250	121	0.155
	3	105	76	1847	526	0.673
	4	100	75	884	284	0.363
	5	110	80	2000	568	0.726
State Average						0.480
ARKANSAS	1	95	78	2524	694	0.887
	2	100	79	2615	718	0.919
State Average						0.890
CALIFORNIA	1	85	65	25	60	0.077
	2	100	72	660	226	0.289
	3	90	70	238	117	0.150
	4	85	68	884	276	0.353
	5	110	80	2000	568	0.726
State Average						0.159
COLORADO	1	95	64	40	66	0.084
State Average						0.084
CONNECTICUT	1	95	75	1150	349	0.446
State Average						0.446
DELAWARE	1	95	78	2043	574	0.733
State Average						0.733
D. of C.	1	95	78	2043	574	0.733
State Average						0.733
FLORIDA	1	95	78	2875	782	1.000
State Average						1.000
GEORGIA	1	95	76	2396	661	0.845
	2	95	78	2708	740	0.946
	3	95	79	2600	715	0.912
State Average						0.870
IDAHO	1	90	62	40	64	0.081
	2	95	65	96	80	0.103
State Average						0.081
ILLINOIS	1	95	75	1158	351	0.449
	2	95	76	1450	424	0.543
	3	95	78	1875	532	0.680
State Average						0.489
INDIANA	1	95	75	1158	351	0.449
	2	95	78	2060	578	0.739
State Average						0.515
IOWA	1	95	76	1600	462	0.591
State Average						0.591
KANSAS	1	100	75	1863	528	0.676
	2	95	75	1654	475	0.604
	3	98	72	900	286	0.365
State Average						0.582
KENTUCKY	1	95	78	2000	563	0.720
State Average						0.720
LOUISIANA	1	100	79	2615	718	0.919
	2	95	80	2817	768	0.982
State Average						0.963
MAINE	1	88	70	150	95	0.121
	2	90	73	200	109	0.139
State Average						0.133
MARYLAND	1	95	78	2043	574	0.733
State Average						0.733
MASSACHUSETTS	1	93	75	870	278	0.356
State Average						0.356
MICHIGAN	1	90	72	200	109	0.139
	2	95	75	769	254	0.324
	3	95	75	1038	321	0.410
	4	90	71	200	100	0.138
State Average						0.365
MINNESOTA	1	95	70	150	96	0.123
	2	95	75	769	254	0.324
	3	95	75	914	290	0.371
State Average						0.319
MISSISSIPPI	1	95	79	2619	718	0.919
State Average						0.919
MISSOURI	1	95	78	1875	532	0.680
	2	98	78	2060	579	0.740
State Average						0.689

Table is continued on opposite page

State	Degree-Hour Zone	Col. 1 Design Dry Bulb Temp. F	Col. 2 Design Wet Bulb Temp. F	Col. 3 Hours in 24 Hr Day Wet Bulb Is 66 F or Over	Col. 4 Seasonal Factor (See formula in heading)	Col. 5 Climate Factor $F_c = F_s/782$
MONTANA	1	95	65	12	59	0.076
State Average						0.076
NEBRASKA	1	95	75	1654	475	0.606
	2	98	72	900	286	0.366
	3	98	72	776	255	0.325
State Average						0.522
NEVADA	1	95	65	10	59	0.075
State Average						0.075
NEW HAMPSHIRE	1	90	73	200	109	0.140
State Average						0.140
NEW JERSEY	1	95	75	1464	427	0.546
	2	95	78	1460	428	0.549
State Average						0.548
NEW MEXICO	1	95	70	140	94	0.120
State Average						0.120
NEW YORK	1	90	73	200	109	0.140
	2	93	75	725	242	0.310
	3	95	75	1464	427	0.547
State Average						0.458
NORTH CAROLINA	1	95	78	2580	708	0.906
	2	95	78	2313	641	0.820
	3	95	75	2201	612	0.782
State Average						0.828
NORTH DAKOTA	1	95	70	150	96	0.123
State Average						0.123
OHIO	1	95	75	1080	331	0.424
	2	95	78	1742	498	0.638
State Average						0.478
OKLAHOMA	1	98	72	900	286	0.365
	2	101	75	1800	513	0.656
	3	101	77	2357	653	0.836
State Average						0.684
OREGON	1	95	65	80	76	0.098
	2	90	68	162	97	0.124
State Average						0.122
PENNSYLVANIA	1	95	75	725	243	0.310
	2	95	75	1059	326	0.417
	3	95	78	1460	428	0.547
State Average						0.494
RHODE ISLAND	1	95	75	1150	349	0.446
State Average						0.446
SOUTH CAROLINA	1	95	76	2396	661	0.846
	2	95	78	2708	740	0.947
State Average						0.878
SOUTH DAKOTA	1	95	72	776	254	0.325
	2	95	70	240	119	0.152
	3	98	72	900	286	0.365
State Average						0.305
TENNESSEE	1	95	75	2201	612	0.783
	2	95	78	2410	665	0.851
State Average						0.824
TEXAS	1	100	69	809	262	0.335
	2	100	72	1050	324	0.414
	3	100	74	1800	512	0.655
	4	100	78	2700	739	0.946
	5	95	79	2824	769	0.984
	6	95	80	2912	792	1.013
	7	100	80	2912	793	1.015
State Average						0.872
UTAH	1	95	64	8	58	0.074
	2	95	65	36	65	0.084
State Average						0.079
VERMONT	1	90	73	200	109	0.140
State Average						0.140
VIRGINIA	1	95	78	2580	708	0.906
	2	95	78	2313	641	0.820
	3	95	75	2201	612	0.783
State Average						0.855
WASHINGTON	1	85	65	92	77	0.098
	2	93	65	15	60	0.076
State Average						0.094
WEST VIRGINIA	1	95	75	2000	561	0.717
State Average						0.717
WISCONSIN	1	95	75	769	254	0.324
	2	95	75	1123	342	0.438
State Average						0.346
WYOMING	1	95	65	20	61	0.078
State Average						0.078

Sources: 1949 ASHVE Guide; York Application Manual; Summer Weather Data, published by the Marley Co.; ACRMA Standards.

64 F wet bulb is justified, particularly with 24 hr per day records.

Seasonal Factors Are Tabulated

Table 1 (herewith) shows for each of 65 locations the calculated factors, F_s, on a 24 hr per day basis in column No. 5, on a 12 hr per day basis in column No. 7, and on an 8 hr per day basis in column No. 9.

The 12 hr per day figures would presumably apply to theaters, supermarkets or other similar commercial establishments, while the 8 hr per day figures are applicable to department stores or office buildings of a general class. Hotels, apartments or residences are used 24 hr per day and these are thus directly covered by the 24 hr figures.

Comparison of the F_s factors for Boston and Houston, as tabulated in Table 1, shows the ratio of F_s Houston/F_s Boston to be 2.75 for 24 hr per day, 2.18 for 12 hr per day, and 1.93 for 8 hr per day.

It is not believed that this variation in factors for other than a 24 hr basis is of important significance unless a particular analysis of the application of air conditioning is narrowed to a certain market.

A further analysis of the effect of the weighting applied to summer design temperatures and seasonal duration can be determined from the following:

The Dallas calculations, Table 1, indicate for 24 hr per day an F_s content made up 100/2871 or 3.5 percent dry bulb temperature influence, $(2 \times 78)/2871$ or 5.4 percent wet bulb temperature influence, and the balance of 91.1 percent as the influence of the number of hours of wet bulb temperature 66 F or above. For Boston, the design dry bulb influence is 92/1112 or 8.3 percent, the design wet bulb influence is $(2 \times 75)/1112$, or 13.5 percent, and the balance of 78.2 percent is the result of the hours duration of wet bulb 66 F or higher.

How the Climatic Factors Were Developed

The step-by-step procedure followed in the development of climatic factors by zones was as follows:

Step 1 — The map of summer wet bulb temperature data, Fig. 1, was revised to conform more nearly to county and trading area boundaries as indicated in Fig. 2.

Step 2 — Seasonal factors F_s were calculated in accordance with the details provided in Table 2 for each temperature zone and each state [see Air Conditioning & Refrigerating Machinery Association's Standards for Air Conditioning for Comfort, 1947]. Column No. 4 of Table 2 indicates the seasonal factors, F_s, for the respective zones of which Florida is the maximum with a value of 782. Column No. 5 of Table 2 is the calculation of the climatic factor, F_c, which in turn is its relation to the factor applicable to Florida which is established as 1.0 or unity. We propose that for purposes of measurement of air conditioning potentials, other areas have a "discomfort" relative to Florida as indicated in column No. 5 of Table 2.

Step 3 — Fig. 3 has been prepared to indicate relatively the size of each state (based on its share of 1948 retail sales as compiled by the Bureau of the Census.) This is pertinent

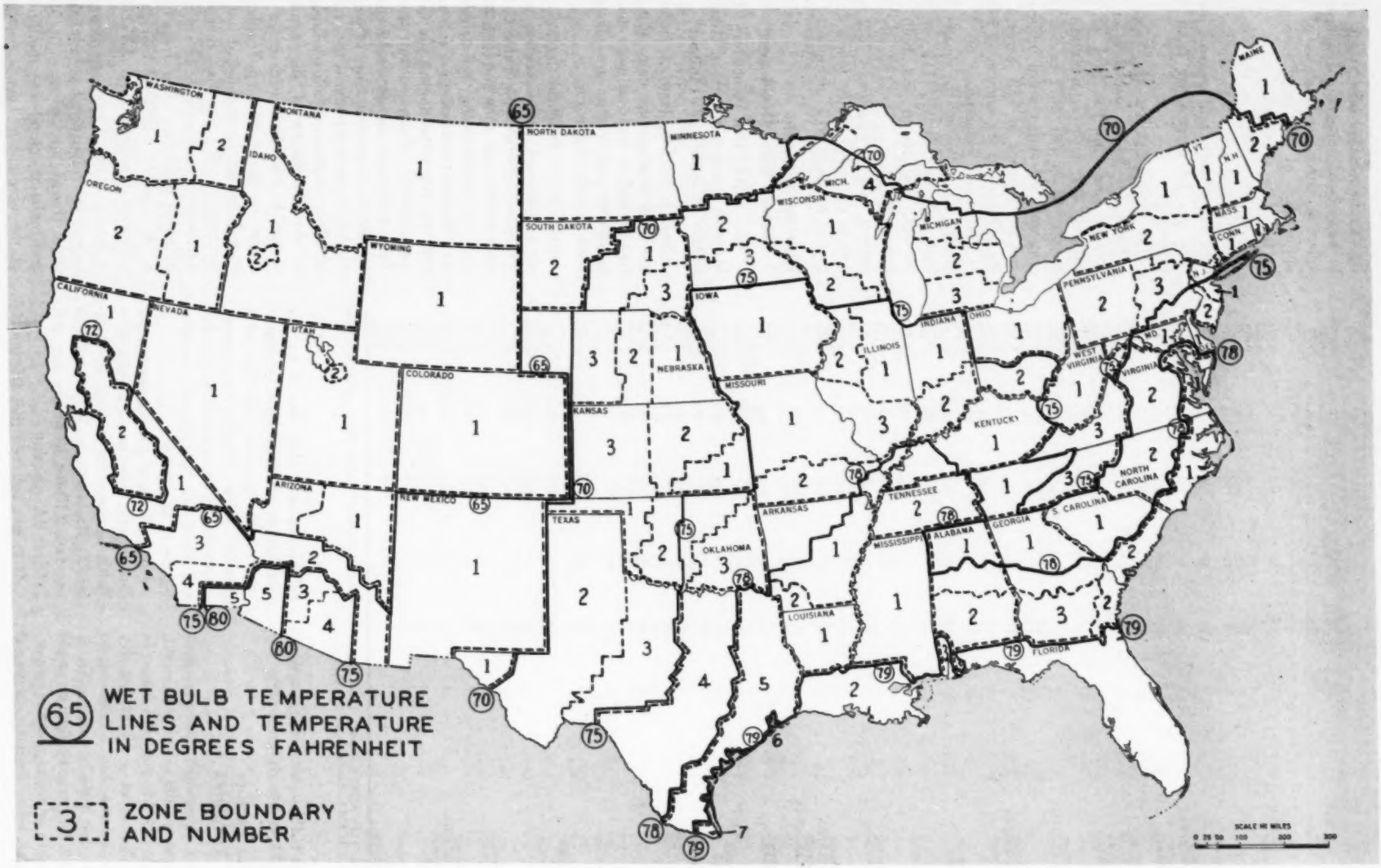

FIG. 2 — CLIMATIC FACTOR DEGREE-HOUR ZONES. This map incorporates data from Fig. 1 revised to conform more nearly to county and trading area boundaries. (Base map copyrighted by Rand, McNally & Co., Chicago)

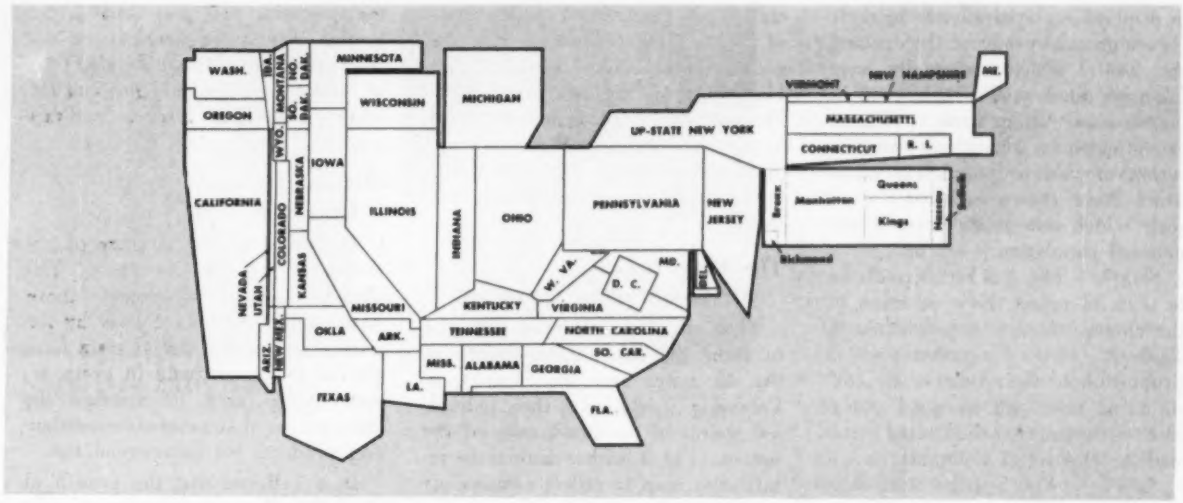

FIG. 3 — RETAIL SALES MAP of the U.S. for 1948, based on Bureau of the Census figures, indicating the relative importance of the states as to their need for and capacity to purchase capital goods

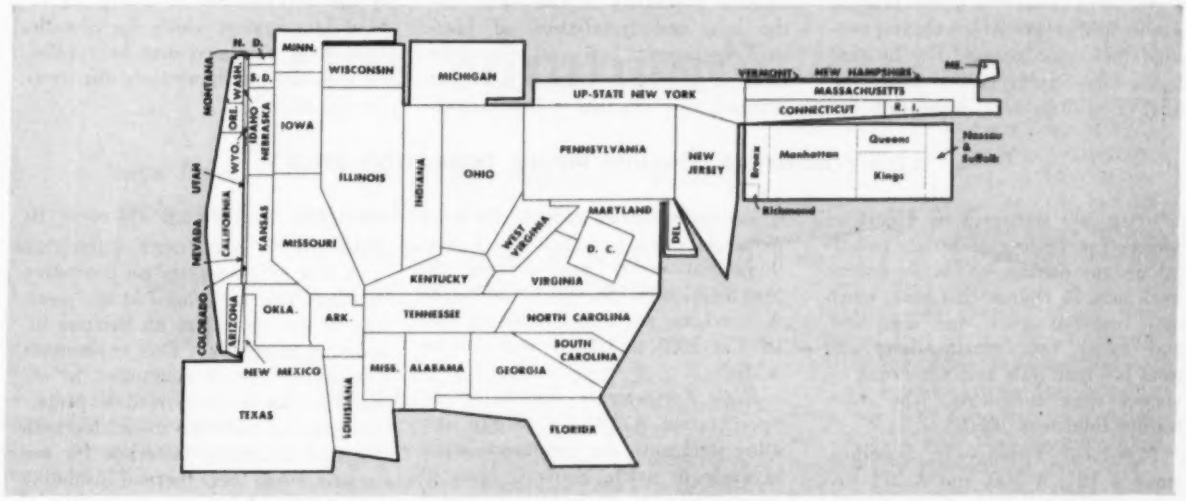

FIG. 4 — ADJUSTED FOR AIR CONDITIONING climatic factors (F_c) this 1948 retail sales map is a graphic portrayal of the market for air conditioning for summer cooling for comfort in the U.S.

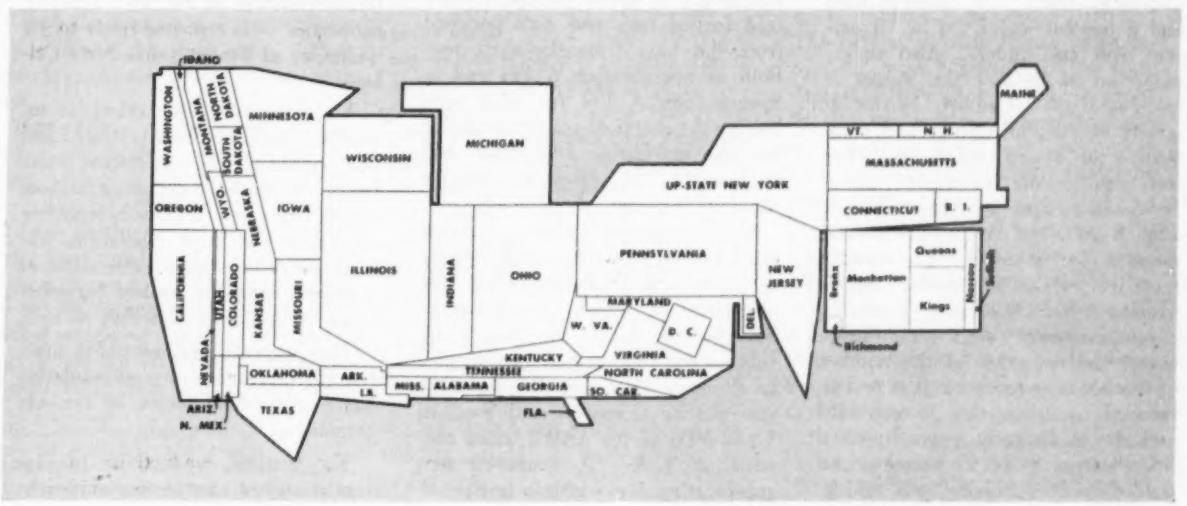

FIG. 5 — THE HEATING CLIMATIC FACTOR has been used to adjust this map to show the relative market for heating equipment, using 1948 retail sales as a base

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in displaying graphically the markets for commercial products, the demand and use of which historically have followed retail sales distribution in the various trading areas. Fig. 3 can in effect be considered a modification of various population maps which have shown each state to a scale which reflects its share of the national population.

Step 4 — Fig. 4 is Fig. 3 re-drawn to scale to reflect the application of the climatic factors as calculated in Table 2. Fig. 4 represents — in proportion to their relative air conditioning sales and purchase potentials — the states of the United States and the District of Columbia.

Step 5 — Fig. 5 is the retail sales map of the U. S. adjusted for the heating climatic factor based on degree days as used in winter heating system design or in calculating seasonal fuel consumption. The heating degree day information from the ASHVE Guide was developed for each state and related to the state of North Dakota, which has the greatest year 'round heating load. The effect on the relative sizes of Florida and Texas should be noted in contrast with the correction applied and shown in Fig. 4 to reflect the summer air conditioning potential.

The Year 'Round Air Conditioning Potential

Thus, Fig. 3 is a map distorted to show the relative importance of the 48 states and the District of Columbia in relation to their individual shares of the retail sales of the nation. Fig. 4 further distorts the retail sales map to reflect summer air conditioning potentials, whereas Fig. 5 is a distortion to represent the relative potentials of the states for the sale and installation of heating equipment. By an aggregate analysis of trading areas in a similar manner, it is possible to demonstrate the potential for year 'round air conditioning systems and to use the comparative data in the development of quotas for sales guidance and for other important market analysis work.

Climatic Factors Proved by Use

The proof of any measure of potential is its effective use. The climatic factors developed above have been in use since 1949 by the authors' company and to date have proved to be adequate in every respect when used to measure the distribution of summer air conditioning products for commercial use.

It is believed that the growth of the market for year 'round residential air conditioning may possibly justify the development of a new set of base data against which the climatic factors as calculated may be applied to measure the potentials for residential sales.

ASTM COMMITTEES CONSIDER PIPING, INSULATION SPECS

AT THE 300 MEETINGS of American Society for Testing Materials technical groups during ASTM committee week held in Detroit this year, much new research work was discussed, and many new specifications and tests for materials and numerous revisions were completed. The registration total was 1050.

Pipe and Tubing—In Specifications A 161, A 200, and A 271 covering still tubes for refinery service it is proposed to change the weight tolerances from "3½ percent over and 5 percent under" to be "5 percent over and under." Also an explanation as to how the weight is calculated will be added. In the interests of standardization and elimination of discrepancies the flange test requirements for welded tubing furnished to Specifications A 178, A 226, A 249, and A 250 are recommended for revision. An existing tentative revision to Standard Specification A 271 for seamless austenitic chromium-nickel steel still tubes covers the reduction of the number of tension tests required. It is recommended to adopt this as standard and also to similarly revise Standard Specification A 268 for seamless and welded ferritic stainless steel tubing.

Plates for Pressure Vessels—In order to permit Specification A 300 to cover steel plates suitable for temperatures down to minus 325 F, the 9 percent nickel steel covered by Specification A 353 will be included. A provision for stress relieving this steel at 1025 to 1085 F will also be added.

High Temperature Bolting — In Specification A 194 for carbon and alloy steel nuts, the recommendation is made to delete grade O nuts, to exempt all nuts too large to be tested in a 60,000 lb machine from the stripping test, and to exempt hot and cold forged nuts and nuts punched from flat bars from the drift test. Both in Specification A 194 and in Specification A 193 for alloy steel bolting the chemical requirements for the free machining 18-8 grade will be brought into agreement with the standard commercial grade.

High Temperature Pipe — Because of objections of the American Society of Mechanical Engineers boiler code committee to certain provisions of Specification A 155 for electric fusion welded pipe, it has been decided to eliminate class 2 and re-word the specification to comply with Sections I and VIII of the ASME boiler construction code. A proposed new specification for seamless ferritic alloy steel forged and bored pipe is under consideration in a subcommittee. This specification will cover 10 grades of steel.

A new subcommittee on protective coatings was authorized at the meeting of the committee on thermal insulating materials. This implements the action of the committee in expanding its scope to include protective coating materials associated with thermal insulating materials for use in preserving their thermal insulating efficiency. Another new project of the committee — research on the effect of moisture on thermal insulating properties — is reported ready to get underway at Pennsylvania State College.

A racking load test method for insulating board has been prepared and was approved for committee letter ballot. A proposed sampling method, which originated in the subcommittee on block and pipe insulation, has been suggested for consideration as a general sampling method for other types of insulating materials as well.

The proposed recommended practice for clearances of pipe insulation has received final review by the subcommittee.

The thermal conductivity of pipe insulation can now be determined by a proposed test method, which is ready for committee letter ballot.

NEWSPAPER HEADLINES about heat waves will probably appear this summer, but . . . . .

OUR SWELTERING FRIEND won't need to read them to find out he's uncomfortable

"Looks Like a Hot Summer"

. . . . says Lucian M. Balee. Last summer's weather was partly responsible for wider interest in summer cooling. He believes — as of now — it'll be the same thing all over again this year

THIS SUMMER SHOULD be hot and wet. New Yorkers, for example, can expect temperatures around 100 deg and a mean temperature for the summer about 2 or 3 deg above the mean normal for the last 131 years. This would give us a mean temperature this summer of about 74.5 deg — and the rest of the country can expect about the same thing. Precipitation should also be above normal.

There is no indication as yet that cooler and drier summers are in sight. Some of the "Top Brass" in the scientific world tell us that the world is getting hotter — and especially the United States. This warming up process has been going on for 20,000 years, since the glaciers started retreating. We are now moving up on the temperature scale at a very rapid rate, and should continue to warm up until about 20,000 A.D. Many outstanding scientists support the "weather cycle" theory.

New York City has a climate more closely resembling the continental type than the maritime. Its weather is mostly influenced by highs and lows from the west. Of course, we occasionally get a storm from the sea — and when this happens Nature sometimes "throws the book at us". But as a general rule "as New York goes meteorologically, so goes the nation". If New York summers are hot, the rest of the country is hot — but hotter. We have some sea breezes in the summer to help keep us cool — but we also have high relative humidity, which makes the temperature seem higher. When study and analysis of the past performance of New York summers indicate that we are going to be hot in the future, then the rest of the country might as well prepare to swelter, too.

The trend to hotter and more humid summers is quite general throughout the country. The precipitation has been moving up for the last 30 years and the average mean for the last 12 years is above normal. For the next 30 years, the average should be still higher. On the average, for many years to come it appears that the summers will be "warmer and wetter" and that the lows for the "cool" cycles will be above the highs for the "warm" cycles prior to 1930.

The U.S. Weather Bureau has issued new "normals" for the entire country, effective this year and based upon the 30 year period from 1921 to 1950. The new normals for New York City are very much higher in most instances than the old ones. The action was taken ostensibly for the purpose of bringing the older stations of the country in line with the newer ones. However, there are many stations which were established in 1871 and New York is one of them. It is hard to believe that the records of the 50 years prior to 1921 were discarded in establishing the new normals. Could it be that the Weather Bureau has decided that the "above normal" temperatures that we have had for the last two decades are with us to stay?

What is the reason for all this increased heat in our land? Many theories have been advanced but no one, of course, knows for certain. Some say that the earth is shifting on its axis and that in time the equator will run through New York and the north pole will be somewhere around Australia. And there is the theory of solar radiation and sun spots. Others blame ocean currents. The carbon dioxide theory pops up every so often. Some claim the Gulf Stream is moving in closer. It could be that the crust of the earth is getting warmer from heat conduction from below as well as solar radiation from above.

Anyhow, a normal summer is a hot summer. An above normal summer is a torrid summer. When the rest of the seasons "turn on the heat" we like it — but when summer goes on a rampage and turns on the heat we suffer. The only answer is air conditioning.

[While the information contained herein has been obtained from sources which I believe to be reliable, it is not — however — guaranteed. Neither are the conclusions and predictions. But I still say that this summer is going to be a scorcher.]

Mr. Balee has made a hobby for some years of predicting the weather — and other events. He's been widely quoted in New York newspapers because he's so often been right. Neither he nor we guarantee his prediction for this summer; in fact, in some ways, we hope he's wrong.

Operating Problems Discussed at American Power Conference

ATTENDANCE AT THIS year's American Power Conference, which is sponsored by the Illinois Institute of Technology together with several cooperating universities and engineering societies, totalled around 2200 — an increase over last year. Several of the sessions were devoted to subjects of interest to HPAC's readers. Very brief excerpts or summaries of a few of the talks given at these sessions are presented here.

Engineering Problems in Packing House

LOWELL E. JOSLIN, Krey Packing Co., St. Louis —

In checking our heat balance, we found that our 1250 kva turbogenerator could supply sufficient 120 lb extraction steam to satisfy the process demand. We were deficient in a-c power. Our refrigeration capacity was adequate, but we were short of 5 lb process steam. This 5 lb steam deficiency was found to be due to a much greater demand for hot water, a demand that is increasing steadily due to higher standards of cleanliness and bacteria control in all federally inspected plants.

Among other things, we considered the installation of a turbine driven centrifugal ice machine, with the thought of decreasing the electrical load for refrigeration and heating water with the exhaust. But our hot water and refrigeration load curves did not correspond closely enough to permit this and the reduction in load on the generator was not enough to get us out of our difficulty.

About this time, one of the equipment sales representatives came to us to see if we couldn't figure out some way to use his centrifugal machine. One of his suggestions was to put two steam condensers on a turbine driven unit, circulate house hot water through one and condense the remainder of the exhaust by using cooling tower water in the other. The next day we were discussing this suggestion of two condensers when it occurred to us that the next thing to two condensers is a split condenser — that is, a condenser split on the water side to permit cleaning one side while the other half is in operation, and that our present 1250 kva unit had such a condenser.

The end result is that all the water for both the boiler and house hot water requirements is passed through one side of this condenser, while tower water is available for circulation through the other side.

To increase flexibility and supply the demand for 5 lb process steam, two eight-cylinder, 720 rpm, ammonia compressors driven by steam turbines through reduction gears were installed. To improve refrigeration efficiency, our low pressure load was taken care of by two motor driven booster compressors with liquid cooling for the low side load through coils in the higher pressure suction trap.

Interest in Heat Pump Growing

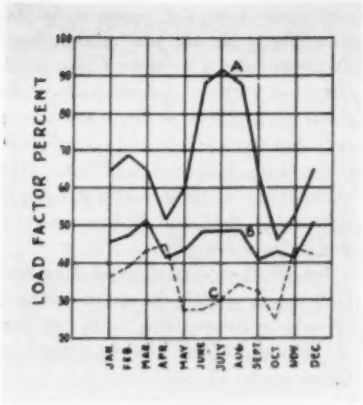
PHILIP SPORN and E. R. AMBROSE, American Gas and Electric Service Corp. —

Interest in the heat pump has been growing for a number of years, but it has been only recently that the air conditioning manufacturers and associated industries have engaged in active and extensive research to improve the equipment and the operating cycle. It is rather surprising that only 44 installations were made in the United States in all the years prior to 1944, even though the first two installations were made in late 1934 and early 1935. Today, there are about 1100 reported installations in the United States. In all probability there are a considerable number of additional installations which are operating but have not been reported.

It is interesting to note that 52 percent of the total heat pump air conditioners are residential and 48 percent are commercial. Of the residential group, 60 percent use water as the heat source, 18 percent use air, and 7 percent use ground. Of the commercial, 49 percent use water as the heat source, 43 percent use air, and 1.6 percent use the ground. [The remainder in each group also use supplemental heat.] During the last few years the percentage of installations using air as the heat source has been increasing.

The total of approximately 1100 heat pump installations in the United States after 18 years of activity cannot be considered as a notable achievement under any circumstances. One reason for this relatively small number of installations is that the prevailing opinion of many engineers, architects, and contractors is that the heat pump is still in the experimental and developmental stage. Heat pump systems will undoubtedly increase at a much faster rate as these groups become more familiar with the operating cycle and learn of the satisfactory performance of actual installations.

It was for this reason that the companies of the American Gas and Electric system made a number of installations in their various office buildings throughout the territory and started in 1949 an active heat



MONTHLY AND ANNUAL electric power load factors for an office building having a heat pump, and for a department store in the same area having a fuel fired boiler plus a conventional mechanical cooling system. The two buildings have approximately the same heating and cooling requirements. The load factor is based on the maximum 30 minute integrated demand for the period.

Curve (A) is the monthly load factor of the heat pump (only) in the office building. The annual load factor is 57.8 percent.

Curve (B) is the monthly load factor of the total load, including the heat pump for the office building. The annual load factor is 43.2 percent.

Curve (C) is the monthly load factor of the total load, including the conventional cooling system for the department store. The annual load factor is 24.8 percent.

pump promotional program. The first installation, made in 1934, and the 18 subsequent installations permitted the acquisition of field data and operating experience. These company installations have also been used to arouse public interest and to demonstrate the general satisfaction of the heat pump.

The heat pump, because of its ability to furnish heating and cooling with the same equipment, offers attractive possibilities for improving the electric load characteristics of commercial customers.

In practically all cases studied, the heat pump improved the annual load factor based on the maximum demand occurring during the year and considerably increased the monthly load factors based on the maximum demand occurring during the month.

The six installations on which field data were obtained are fairly representative of today's heat pumps. The annual load factors on these six installations range from 33 to 54 percent.

In most of the commercial installations studied, the heat pump system materially improved the monthly and annual load factors. In contrast, a fuel fired heating boiler plus a mechanical cooling system, on which data was available, always considerably lowered the total annual load factor.

Saving Heat in Paper Mills

NYLE AUSTIN, Marathon Corp., Menasha, Wis. —

Because of the heavy demands for low pressure steam, the average paper and pulp mill has the opportunity to economically generate all or part of its electrical requirements. It is on this basis that almost every power plant in the industry is designed. If a mill is to continue to generate byproduct power for its operations, it is essential that the balance between its steam and power demands be maintained. Paper mills built 25 to 50 years ago were able to obtain this balance with 150 or 200 lb saturated steam. But, as drying pressures were raised and electrical demands increased, higher initial steam pressures and temperatures became necessary. As an alternate to installing new higher pressure boilers and turbines, many mills turned to purchased power. Consequently, the average paper mill generates steam at two or sometimes three pressures, produces part of its power on back pressure or extraction turbines and purchases the balance of its requirements. Furthermore, as steam and power loads always are on the increase, the average power plant seldom has reserve capacity.

Steam in the paper mill is used primarily for three purposes; the drying of pulp and paper, heating of large quantities of stock or process water, and heating of large volumes of air. Each contributes to the total steam load and must be subjected to continuous scrutiny.

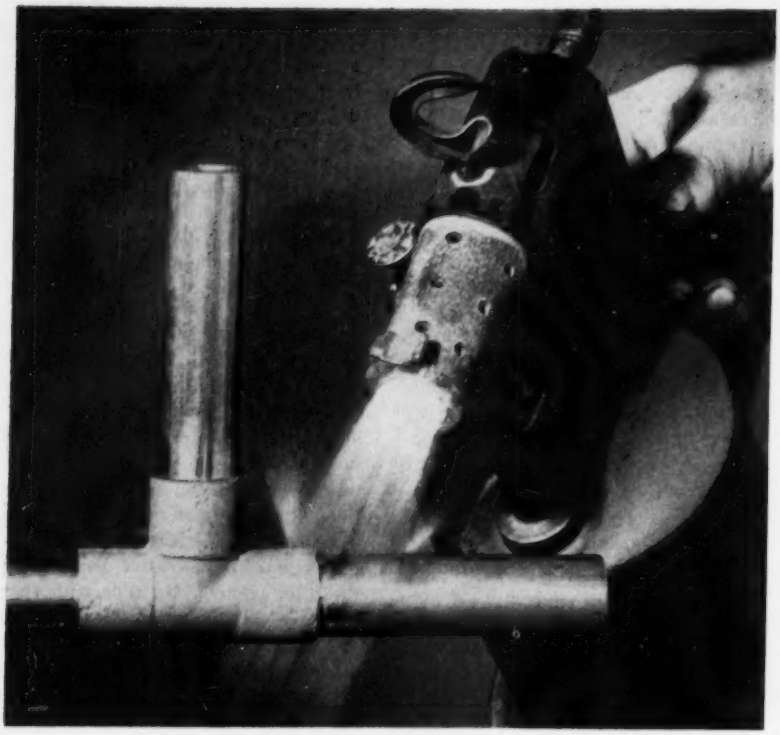
As the average paper mill requires large quantities of heated water, every condenser and cooler becomes a potential water heater. We use turbine condensers to temper large quantities of mill supply water. By throttling flow to meet mill requirements, very sizable savings can be made in the usage of steam for direct heating. Often it is more economical to operate the turbine at a lower vacuum if higher water temperatures are required. All direct heating of water and stock should be done with exhaust steam and, whenever possible, indirect heaters are applied to save condensate. Closing up the water system in the mill by recirculation will raise water and stock temperatures, thus reducing steam requirements and excessive demands on the filter plant. For mills with very high demands, water heating in the paper machine air economizers should be investigated. The possibilities of saving steam and improving power generating efficiencies by changes to the water system are well-worth a comprehensive survey.

For every ton of paper dried on a paper machine, approximately 40 tons of air must be heated to room temperature. Excessive machine exhaust and mill ventilation should therefore be checked. Heating coils should be maintained in good condition and designed for low pressure exhaust steam. The installation of paper machine exhaust economizers will often pay off in reducing winter mill heating requirements. Mill ventilating fans consume sizable amounts of power. The proper selection of these fans and a little discretion in their operation will reduce electrical demands.

Feedwater treating equipment in the paper mill power plant is normally designed for 30 to 50 percent make-up, but sooner or later increases in production and changes in processes result in overloaded equipment. We have found that a survey of the condensate system normally reveals careless design and installation of steam-using equipment with the result that sizable quantities of condensate finds its way to the sewer.

There are many plants totally lacking in metering equipment. If daily load changes are to be followed and accurate data for formulating a long-

[*Concluded on page 89*]



Five Simple Rules for

Making Copper Tube Joints

Soft solders are usually adequate for most tube and fitting installations but hard or silver solders are recommended to be used for the higher temperatures, pressures or stresses

By John S. Coe
Manager of Products
Chase Brass & Copper Co.

COPPER WATER TUBE and fittings designed to provide proper tolerances may be easily joined using soft solders by following five simple rules. Pre-tinning is unnecessary because capillary action will draw molten solder between the tube end and the inner surfaces of the fitting to form watertight joints.

Here are the five simple rules:

1) Polish outer tube ends and inner surfaces of fittings.

2) Apply a suitable flux to these areas.

3) Apply heat and solder.

4) Remove residual solder and flux.

5) Let joint cool.

Tube ends should be cut square with a hacksaw having 24 or 32 teeth, or by means of blade cutters which are available for diameters up to 3 in. A template of thin straight edged metal or stiff paper is helpful as a line guide for saw cuts in large diameter tube. Mitre tools are available for cutting copper water tube sizes up to 2 in. Burs are easily removed from inside and outside tube edges with a half round file. The chamfering of these edges will make joining of tube and fitting easier in the larger sizes.

No. 00 steel wool or sand cloth may be used to polish the outer surfaces of tube ends and the inner surfaces of fittings before flux is spread on these areas.

Practical Pointers on Soft Soldering

The purpose of the flux is to assure chemically clean surfaces and to prevent oxidation when heat and solder are applied. Flux should be mildly corrosive for cleaning metal surfaces but this action should cease during the soldering process. A flux well suited for copper consists of zinc and ammonium chlorides prepared with petrolatum in convenient paste form.

Soft solder is adequate for joints in water lines where temperatures do not exceed 250 F and there are no excessive pressures or stresses. Types of solders that may be used include 50/50 tin-lead, 95/5 tin-antimony or other tin-lead alloys.

Heat may be applied to the joint by means of a gasoline blow torch or an air-gas torch of suitable size. If a torch is used, wire solder should be applied as the flame is moved away from the joint. At the right temperature solder will melt and can be flowed into the joint until it is filled. Care should be taken to avoid overheating the joint and consequent burning of the flux. Solder will not enter the joint and its surfaces will have to be re-cleaned should this occur.

The soldering of fittings that are more than 2 in. in diameter may be done by heating with one or more torches but greater care is required to prevent spot overheating — particularly if more than one heat source is applied. If the flame is moved uniformly over the entire area of the fitting until a point just below the melting point of the solder is reached, large fittings can be conveniently soldered by re-application of heat to limited areas.

By applying the flame over an arc

of approximately 2 or 3 in., wire solder can be used to test the temperature of the joint and then flowed into the joint to form a soldered section. By repeating this step process, overlapping sections can be made until the entire joint has been filled with solder.

When joints exceed 4 in. in diameter, heat is rapidly dissipated so that best results may be had through the use of an oxy-acetylene torch with a medium sized tip. For smaller sizes of copper water tube, gasoline, butane, propane or air-acetylene torches, or thermal electrical units may be used.

Surplus solder and flux may be removed with a rag or brush to improve the appearance of the work. Then the joint should be allowed to cool.

Hard Soldering Procedures

Hard solders are those that have melting points above 600 F. Many of these have melting points of more than 1100 F and, depending on their composition, are identified as silver solders or low temperature brazing alloys. High silver content solders provide desirable properties for soldering copper water tube and fittings including flow, joint penetration and high strength. Proprietary alloys that meet the requirements are also available.

These proprietary alloys may be used as solders without flux, provided that tube and fitting surfaces are clean. If flux is used, they will "wet" tube and fitting surfaces and assure better flow and penetration of the joint. Although there are a number of excellent prepared fluxes available, a satisfactory flux consists of a mixture of powdered borax and alcohol or water that forms a thin milky solution. It may be painted on to provide a thin film for good hard soldering. Care should be taken to control the amount of flux so that it will not "load up" and cause uneven distribution of solder. Excessive amounts of flux tend to fillet and cause faulty joints.

Some hard solders don't penetrate the full depth of joints as readily as soft solders but because of their physical strength, nominal penetration of $\frac{3}{8}$ in. or so is usually adequate. The high temperatures required to flow hard solders also tend to anneal the tube at or near the joint so that a well-filleted joint has greater strength than the annealed tube at this point.

Blow torches and air-gas torches are suitable for hard solder joints up to 1 in. in diameter, but oxy-acetylene flames are recommended for larger sizes. The flame should be moved over the entire joint until it is uniformly heated to a dull red if fittings are of 1 in. diameter or less. Preheating of all joint and adjacent fitting surfaces is good practice for larger fittings, after which about 2 in. or so of the joint circumference should be heated to a dull red. High temperature oxy-acetylene flames should be kept moving a slight distance from the joint to prevent spot melting while hard solder wire is applied.

Underheating tends to "ball" or load up solder and cause inadequately "wetted" surfaces. Excessive heating may cause cracking in cast alloy fittings or effect a surface condition so that solder flow and adherence is unsatisfactory.

Low flame pressures are recommended to prevent wasteful spreading of the solder. Good penetration of the joint is aided by moving the flame back over the area toward fitting shoulders. A fillet may then be formed at the fitting edge when solder ceases to flow into the joint. Then the joint should be allowed to cool.

Wrought copper fittings may be chilled rather quickly, but cast brass fittings should cool slowly in air to reduce thermal stresses.

POWER CONFERENCE —

[Concluded from page 87]

range program collected, it is essential that adequate metering be available. High and low pressure steam usage and power demands for the various departments should be metered and loads charted. We have found that metering can, at times, be sold to management under the guise of an accounting aid.

Operating a State Hospital Plant

CHAS. R. BENDER, St. Louis State Hospital —

During the heating season we normally keep one boiler on the line, one on bank to be used during peak loads, one laid up in wet storage, and the fourth laid up dry. The boiler which is laid up wet is kept full of water from the continuous blowdown heat exchanger. This prevents external sweating on tubes and headers, and keeps the boiler hot and more nearly ready to go in case of emergency. The boiler is filled with hot treated oxygen-free water.

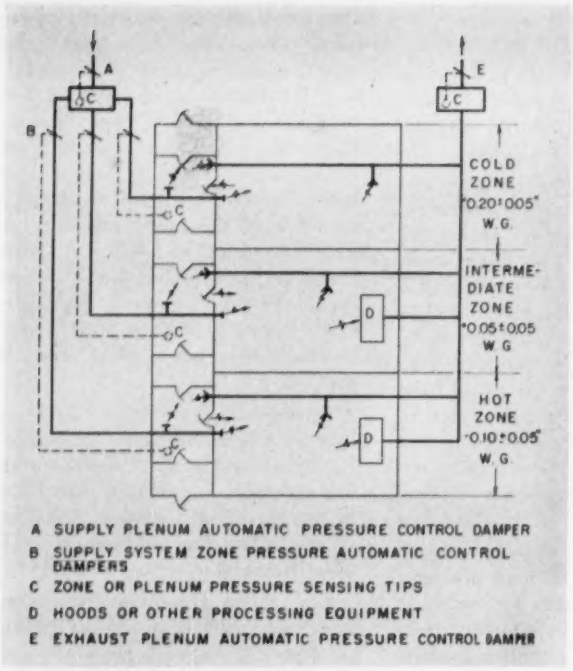
We experienced considerable difficulty with our 1000 ton overhead bunkers. The unlined steel surfaces were eaten through in several places and had to be patched. Finally, we found that waste oil would protect the surface. We get the oil from a nearby filling station and apply it with a broom from a 5 gal bucket. The coal passer stands on the coal and oils out the bunker as the coal is used down.

Using exhaust steam in summer time is always a problem in a non-condensing plant such as ours. We changed a number of water heaters throughout the buildings from live to exhaust steam. We also put a whole building on exhaust steam and saved a tremendous amount of coal. Where the lines were too small, provision was made to switch back to live steam in colder weather.

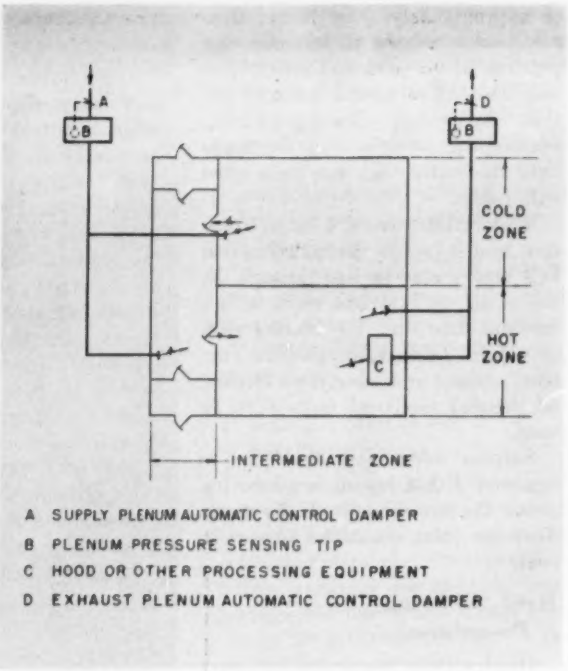
Due to better firing methods, use of more exhaust steam, repairing of leaks and a cheaper coal our fuel bill dropped from $110,000 per year in 1949 to $67,000 per year in 1952.

We still look forward to a greater utilization of exhaust steam in the non-heating season and are thinking of trying the absorption type of air conditioning machine. The type we expect to try will use exhaust steam at zero pressure, comes in packaged units and can be hooked to a steam radiator line. Water under vacuum is the refrigerant and lithium bromide is the absorbent. It is also made in a 25 ton water chiller to air condition larger areas.

We hope to see the day when electric and steam loads are so nearly balanced that the waste of exhaust steam in summer will be at a minimum.



ZONE PRESSURE CONTROL system of ventilation. Zones of different degrees of radiological risk are structurally divided and maintained at different pressures to prevent flow of air from high risk zones to lower risk zones



SERIES FLOW system of ventilation. Air is introduced in the zone of least risk and exhausted from zone of highest risk

How To Design Ventilation for Radiological Hazards

DESIGN OF THE VENTILATION for a process plant or a laboratory in which radiological hazards may be present must be preceded by the selection of the site and the establishment of the internal arrangement of the building. Requirements for safe handling of ventilation air within the building, and its treatment before release to the surrounding atmosphere, may govern in both the location of the building and its layout.

Several Steps in Preliminary Design

The first step in preliminary design is to determine the characteristics of the materials which will be handled in the facility — the level of radioactivity, toxicity and whether the materials are gas, liquid or solid.

The second step is to establish the nature of the processes or the experimental work which will be performed.

The third step is to evaluate the probable contamination of the ventilation exhaust stream. This work goes beyond the usual scope of the ventilation engineer; consequently, the assistance of the health physicist or the radiological engineer will be required.

With the knowledge of how much and what kind of contamination may be expected in the ventilation exhaust, the type of filtration or other treatment can be determined. The efficiency of treatment required will vary with a number of factors — the density of population surrounding the site, local topographical features, prevailing winds and other meteorological factors. Although in relatively uninhabited areas the requirements for exhaust treatment may be less stringent than in heavily populated areas, a careful study of the proposed site and its probable dispersion pattern of contamination with relation to adjacent buildings and thoroughfares should be made. In addition, the ever-present possi-

VIEW SHOWING CORRIDOR of building under construction in which the series flow system of ventilation is used. Air is supplied to the offices adjacent to the building outer wall at the right and is exhausted to the corridor through louvered doors. Additional air is supplied in the corridors and then passes through wall and door louvers into laboratories on the left. Exhaust is finally taken from hoods, equipment and auxiliary room exhausts in the laboratories.

By W. W. McIntosh
Mechanical Engineer
General Electric Co.
Richland, Wash.

DESIGN OF VENTILATION SYSTEMS for radiological hazard control involves all the factors encountered in ordinary work in which noxious vapors or dangerous particulate matter is released into the ventilation air stream. The difference between this and conventional work is principally in the degree of hazard which is involved and the additional refinement in design which is required. Wise site selection and full consideration of ventilation requirements in the planning of interior spaces form the foundation of successful ventilation design. Adoption of a simple foolproof system, strict adherence to the fundamentals of good ventilation and control design, careful attention to details and thorough preparation of drawings and specifications must all be accomplished with more than ordinary skill and foresight to provide a safe, economical facility. A number of such installations have been completed and have given satisfactory performance during several years of service. They have demonstrated the soundness of these design principles.

bility of failure of contamination control must be kept prominently in mind during these studies. The assistance of the trained meteorologist and the radiological engineer is required to properly evaluate all factors and arrive at the requirements for filtration efficiency.

Assign Hazard Rating To Each Activity

With the building site selected and the exhaust treatment requirements determined, the ventilation designer must complete two more steps in preliminary design. A building layout must be devised which is adaptable to all ventilation requirements, and the general scheme of ventilation and control must be decided upon.

Close cooperation with the architect and the process engineer is required to arrive at a building plan which will perform satisfactorily in all respects. This is not an unusual situation, but in this case special consideration will need to be given to the requirements of the ventilation system.

A logical approach to this problem is to assign to each activity which will be carried on in the building a relative radiological hazard rating in regard to airborne contamination. Insofar as processes and operations will permit, activities having similar risk potentials should be grouped together and assigned to zones of similar risk. With these zones established, it becomes the problem of the ventilation engineer to arrange that air will always flow from the areas of lesser risk toward the areas of greater risk.

Two general schemes have been successfully used to provide safe control of air flow:

1) Separate the zones structurally and maintain differentials in air pressure between the zones, the highest risk zone having the lowest pressure level.

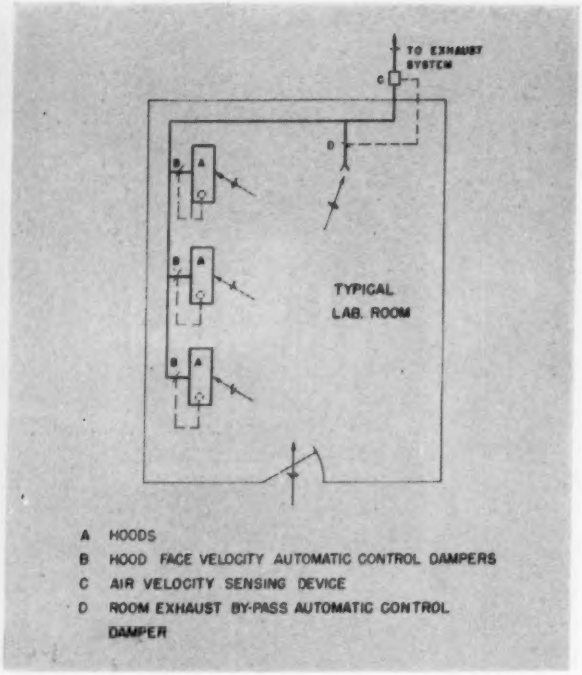
2) Introduce the air in the zone of lowest risk and direct the air to flow, in series, through zones of increasing risk until exhausted at points of highest risk.

The former scheme has been called the "zone pressure control system" and the latter the "series flow system." Neither of these systems is universally adaptable, and mixed systems have been successfully used. From the standpoint of ventilation dependability, however, the more nearly it is possible to adhere to one of these two simple, basic systems, the safer and more foolproof will the installation be.

Higher Than Normal Pressure Drops

Aside from the unusual control requirements, two other features are characteristic of these systems as compared with more conventional ones. Higher than normal pressure drops are required to overcome the resistance of high efficiency filters in the exhaust side, and somewhat higher than normal pressure drop allowances may be required across control dampers on the supply side. These higher pressures — especially on the exhaust side — call for higher fan speeds; consequently, fan vibration problems assume more than normal importance. Exceptional system stability is required for satisfactory automatic

FANS SHOULD BE SELECTED so that relatively large changes in static pressure are required to cause small changes in delivery, when they operate in parallel and discharge into a common plenum



AUXILIARY ROOM EXHAUST BYPASS system. Room exhaust damper throttles to automatically maintain the total flow of air through the room (as measured in the exhaust duct) at a constant value, thus compensating for variable hood or equipment demand

control. This requirement dictates unusual care in the selection of air intake and exhaust locations in regard to wind effects.

The use of either the zone pressure control system or the series flow system depends for safety on continuous operation of both the supply and exhaust systems. Where portions of these systems operate in parallel, failure of a single fan could create dangerous backflow. Consequently, wisdom dictates that parallel units be manifolded to provide common sources of supply and exhaust for the entire building. If this is not done, elaborate and carefully planned interlocks should be provided to prevent such occurrences. The simpler, more foolproof approach is preferred where protection of personnel is involved.

Safety, System Stability Most Be Uppermost

Safety and system stability are two requirements which must be kept uppermost in the designer's mind. All elements of the system should be designed (wherever possible) to fail safe. All air handling elements of the system must be designed in such a manner that uniform, constant, non-pulsating flow of air will be obtained.

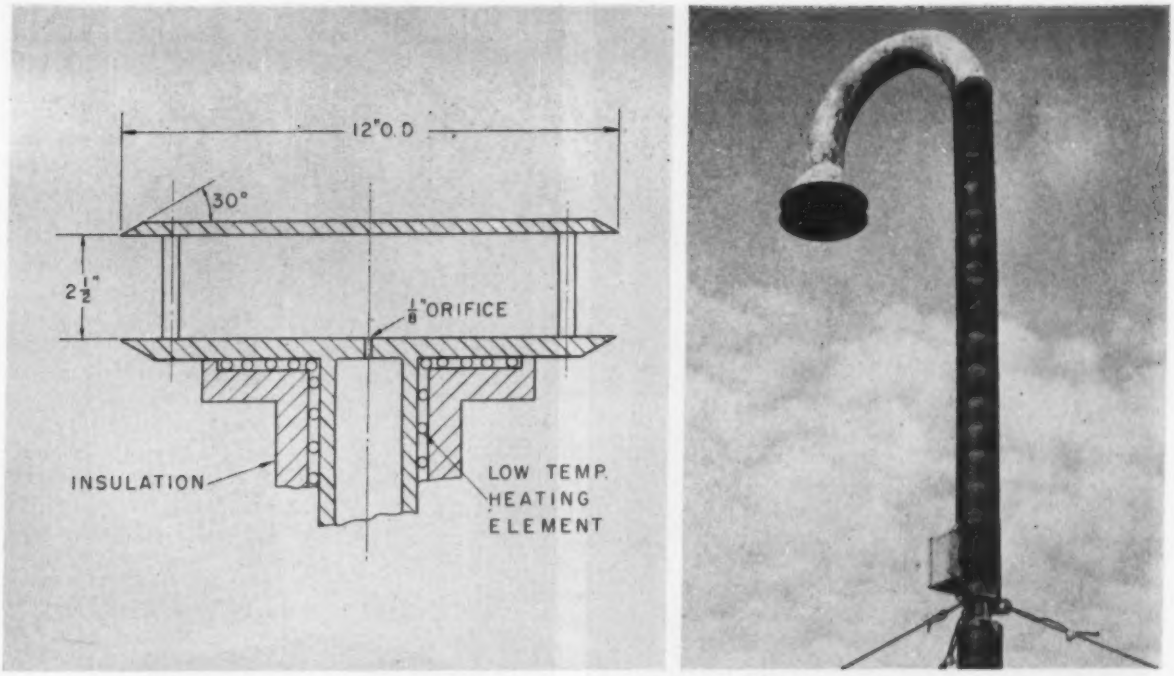
The two types of systems such as described above are shown in accompanying schematic diagrams. Both systems use pressure controls on the supply and exhaust plenums. The experienced designer knows that plenums are tricky things at best. When the pattern of use of several fans serving a single plenum is changed (as in the case where different units are taken out of use for maintenance or repairs) the distribution of air to the various ducts connected to the plenum may be altered. Such variations are not normally of great concern, but in carefully balanced systems, where the direction and quantity of air flow must be rigidly controlled, variation is often unacceptable.

Even with an unchanged pattern of fan use, violent local fluctuations of pressure and flow are observed. Those who have had access to a plenum during operation have probably been acutely aware of the pulsing, swirling air flow within it. While standing in one location, the observer is buffeted from one direction and then the other while the pattern of flow continuously — and often irregularly — varies. These variations are transmitted throughout the system and will affect delicate control instruments at the end of the most remote run of duct. Thus, plenums — if used — should be carefully and amply designed to minimize these effects.

Some engineers have abandoned the use of plenums entirely for this work. They arrange the ducting so as to bring together the discharges or suctions of several fans in such a way that cutting in or out of different units has little or no effect on the distribution of air in the various branches of the system. With this arrangement, the plenum pressure sensing point must be carefully selected in a straight section of the combined flow portion of the duct.

Careful Design for Optimum Conditions

Where fans are operated in parallel, backward curved blade fans are used. The characteristic curve of flow plotted against static pressure should be constantly drooping so



ATMOSPHERIC PRESSURE SENSING TIP for securing a stable reference pressure for control purposes. Photo shows the tip mounted on roof

that for any given static pressure there is only one corresponding flow quantity. The fans should be selected to operate on the rather steep portion of the curve so that relatively large changes in static pressure are required to cause small changes in delivery. With these precautions, a number of fans will operate in parallel satisfactorily with no appreciable load shifting or pulsation.

Depending on the location of exhaust openings in relation to building structure and wind direction, large variations of flow may be induced by the wind — resulting in local unbalance of the system. In systems where control of air flow is important, automatically controlled motor operated dampers are recommended in preference to weighted gravity dampers.

Details of duct design and construction have been found to affect the operation of controlled systems more than might be anticipated. Ducts which are of too light gage or which are insufficiently reinforced may breathe or pant, resulting in pulsations which have disastrous effects on flow or pressure control instruments. Fluttering of loose splitter dampers or turning vanes has similar effects. Improperly designed fan inlets can cause pulsations in fan operation; transitions, tees and elbows that create excessive turbulence also cause trouble. To avoid these difficulties, all portions of the air conveying system must be carefully designed to give optimum aerodynamic conditions throughout.

Selection, Location of Air Supply Terminals

The selection of supply terminals and their location in relation to control sensing points must be given more than usual consideration. In the case of series flow systems, especially, rather high rates of air change are likely to be required to meet the heating and cooling loads, which also puts more emphasis on correct terminal application. Excessive throw from terminals can induce drafts which cause outflow through doors at some points — although the net flow is inward as required for safe operation and as supposedly provided for in design. Hood face velocity controls have been observed to behave quite erratically in cases where supply terminals have discharged in the direction of the hood opening, although from a considerable distance.

Theoretical velocities in the desired direction are seldom realized uniformly through door or other openings because of convection and other factors — such as induced air currents caused by the movement of equipment and personnel and the effect of throw from supply terminals. A practical minimum net design velocity of about 50 fpm may be adopted for doors of normal height.

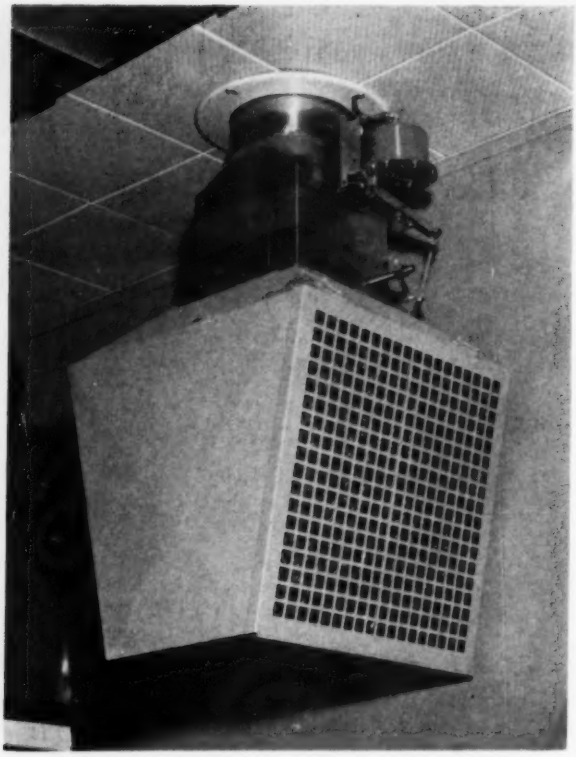
Higher velocities may be required where the level of risk, the height of the opening or other factors may dictate. Hood face velocities of from 100 to 200 fpm are in general use, depending on the design of the equipment and the degree of risk.

Numerous Factors Affect Filter Selection

In the selection of the type and location of air filters for ventilation exhaust, the ventilation engineer will be wise to consult with the radiological engineer in the earlier stages of design. The level of radiological contamination expected, location of the site, convenience and safety of replacement of the filters, and economic considerations will dictate the type of filtration which will be adopted.

In general, it is advantageous to place the filter as near as possible to

HOOD WITH AUTOMATIC face velocity control. Hot wire element is in louvered box at left side of interior. Air flows through short duct connecting to opening in back of hood, past the element and through the louvers to interior of hood. Damper mechanism is shown mounted on exhaust duct at top of hood



AUXILIARY ROOM exhaust damper box. Damper is operated by controller which senses total room exhaust and automatically compensates for variable hood or equipment demand

the process or operation which is the source of contamination, for the purpose of limiting the area in which radiation or poisoning may become a problem. This is not always possible, however, since some types of filters are too bulky to be installed in the building or close to the process.

Chemical Warfare Service type 6 filters, which use a pleated asbestos type paper, permanently mounted in a frame, have been used in large numbers with excellent success. These units are available in a number of sizes up to 24 by 24 by 12 in. thick. This size has a capacity of 800 cfm at 1 in. WG initial pressure drop. Filters using special, fine fiber glass media, compacted to increasing densities in the direction of air flow, yield excellent efficiencies as well. For larger installations, graded sand filters have been used with good results.

Detailed information on the design and performance of filters is available in the classified literature. Document HW 20847*, which is unclassified, summarizes a good deal of information on this subject. The selection or design of scrubbers for the absorption or chemical removal of vapors and gasses is usually the problem of the chemical engineer with special knowledge in this field.

Air Flow Must Be Absolutely Under Control

The ideal ventilation system (from the standpoint of operation and maintenance) would have no controls at all. This ideal is not attainable, however, especially in work where air flow must be absolutely under control at all times for personnel protection.

In common with conventional systems, temperatures and humidities are controlled. In addition, controls are required to maintain designed conditions of building zone pressures and direction of air flow throughout the building, to sense instantly deviations from such designed conditions, and to initiate corrective action automatically or to warn the operator. Controls are also required to provide a stable flow of supply and exhaust by compensating for wind or other effects which can only be partially eliminated by careful selection of building intakes and outlets.

"Tremendous Trifles" Are Involved

In the foregoing, emphasis has been placed on the care which should be taken in all details of design which can affect the aerodynamic stability of the system. This concern is the result of observation of controlled systems in operation. To those unfamiliar with this work, a few observations may be helpful in orienting thought in regard to the tremendous trifles which are involved.

Zone pressure controls may be required to operate within a tolerance

*Obtainable by application to the Atomic Energy Commission, Technical Information Service, Oak Ridge, Tenn.

of plus or minus 0.05 in. WG and hood controls within the tolerance of about 0.001 in. WG. At these low differentials, air tends to act rather more like an incompressible liquid than like the gas it is; consequently, sudden door openings between zones of different pressure, rapid movement of workers or equipment in the immediate vicinity of the control points, regular or irregular changes in delivery or exhaust of air, or changes in the distribution pattern of air between different areas in the same zone all may impose on the control instruments variables in excess of these tolerances.

In response to these sudden changes, the instruments will swing full scale in the direction of correction; and, if the upset is not repeated and the control system is in proper adjustment, the correction will take place in a few seconds through a few cycles of diminishing magnitude.

If, however, these upsets occur frequently, as would be the case with hunting fans or defective ductwork of insufficient rigidity to prevent breathing or fluttering of splitters or vanes, control may be impossible. Such a system may require extensive re-working to provide a good, stable base on which the control instruments can operate. Less severe but frequently repeated variations, while not uncontrollable, may cause constant, destructive hunting of the control equipment — creating a serious maintenance problem.

Supply and exhaust plenum pressure controls operate through motor operated dampers. Where a number of fans serve one plenum, these controls can be arranged to throttle fan dampers in sequence; that is, first one will close, then, if correction is not obtained, the second will operate, then the third, and so on. Simultaneous operation of all dampers may result in less stability of control with a tendency toward over-shooting and hunting. Plenum pressure control may be made sufficiently responsive to iron out the effects of gusty wind, but cannot be relied on to correct for the more rapid fluctuations which may result from improper fan inlet design, hunting between units or other fundamental design faults.

Building zone pressures are usually maintained by controls on the supply system only. The exhaust system is provided with control to maintain constant exhaust plenum pressure. With this type of system, great care should be taken to locate the zone pressure sensing points so as to sense truly the zone pressure. If zones are too large or are structurally divided into parts, it is advisable to provide separately controlled systems of air supply to each part.

Pressure Sensing Points Must Be in Right Places

Velocity controls as applied to hoods or other equipment may operate on pressure differential between the room and the interior of the equipment, or may operate through direct sensing of air velocity with a hot wire electrical device. These controls are used to maintain within certain limits the velocity of air flowing through openings in hoods or equipment. Pitot tubes, orifices or hot wire instruments are used for sensing and controlling the volume of air which passes through ducts. The latter function may be used to maintain constant air flow through rooms where equipment with varying air demand is located. The control operates by opening and closing room auxiliary exhaust dampers to compensate for the varying equipment demand. This type of control is used extensively to maintain ventilation balance. A diagram of this arrangement is shown herewith.

Most applications of differential pressure control instruments compare the pressure in the environment of the sensing point with the pressure at some reference point. The operation of these sensitive instruments is just as subject to disruption by fluctuations of the reference pressure as by fluctuations of the controlled pressure.

A successful solution of the problem of securing a stable reference pressure was found by the use of a specially designed atmospheric sensing tip connected to the reference pressure system through throttling valves and a rigidly constructed surge chamber. One of the diagrams shows this arrangement. Provision was made to prevent the throttling valves from becoming plugged by condensate and to keep the sensing orifice open during freezing or rainy weather. Properly located in relation to wind effects on the adjacent structure, it will sample atmospheric pressure virtually unaffected by direct wind impingement at angles of attack relative to the plane of the discs of up to 15 deg.

Materials for Duct and Fan Construction

Conventional materials are satisfactory for duct and fan construction on the supply system. For the exhaust system, two considerations govern the choice:

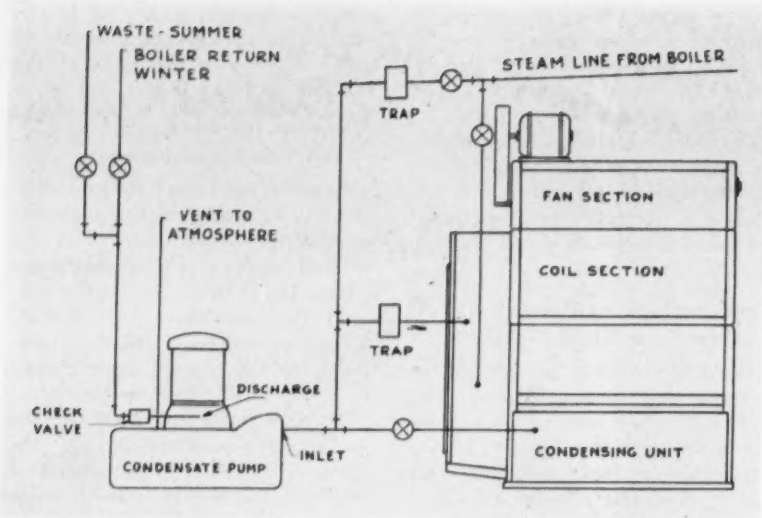
1) The material must be adequate from the corrosion resistance standpoint for the type of vapors, gases or solids which must be handled.

2) All ductwork between the source of contamination and the filters or scrubbers must be made of materials and with an interior finish which will permit cleaning by the decontamination procedures which may be used. These procedures may include flushing with water, detergents or acids; vacuum cleaning; brushing or scrubbing. This portion of the ductwork may have rigid requirements in regard to slope and drainage facilities as well as for material and interior finish.

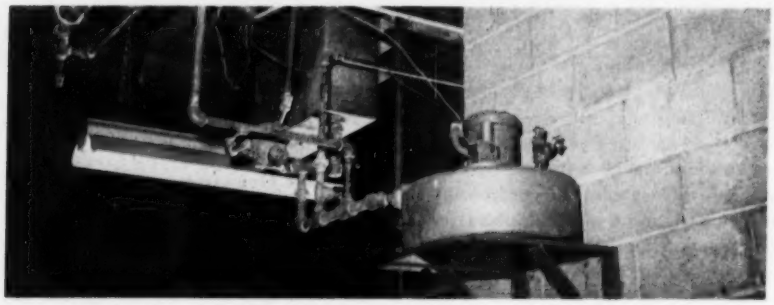
Detailed Drawings, Specifications Avoid Trouble

A great deal of difficulty may be avoided during construction, balancing and operation of the system if care is exercised in the preparation of complete, well considered and unusually detailed drawings and specifications. Since details of design are so important in obtaining satisfactory end results in this work, it is wise to include details of all transitions, elbows, damper boxes, splitters and other features of the ductwork. In addition, it is necessary to give more than usual attention to the elimination of all possible interferences with other crafts, so that undesirable field changes in ductwork detail will not be required.

Specifications should be prepared thoroughly — especially with regard to those features which are not conventional or which require special care in construction. The contractor should be given full warning that the requirements of these systems do not permit normally accepted variations from strict adherence to design. It cannot be expected to obtain work which will adequately meet unusually strict quality requirements unless those requirements are clearly spelled out in the specifications.



THE CONDENSATE PUMP installed with this 20 ton central station air conditioning unit is used both winter and summer by means of the piping and valve arrangement shown



FLEXIBILITY IN LOCATION of the unit heaters for the plant area is permitted by the use of the same type of condensate pump, as shown in this photo of one of them

Condensate Pump Simplifies Air Conditioning Installation

Handles Moisture from Air in Summer, Returns Heating Steam Condensate to Boiler in Winter

A NOVEL METHOD OF getting rid of the moisture condensed from the air is used at the Weil Pump Co., Chicago. The idea is expected to have applications on many similar air conditioning installations.

When it was decided to install air conditioning for the offices, it was found that the logical location for the central plant air conditioning unit was on the floor of a corner of the adjacent plant area. Cooled and dehumidified air in the summer — and tempered air in the winter — are supplied the offices through a duct system. The unit has two 10 ton condensing units, for a total capacity of 20 tons of refrigeration. Plant steam is supplied the unit's heating coil in the winter.

Because it would have been a rather complicated and costly matter to dispose by gravity of the condensate resulting from the moisture removed from the air, a small condensate pump was hooked up with the air conditioning unit to pump the water to waste through overhead piping.

The same pump handles the condensate from the air conditioning unit's steam coil in winter, in which case it is returned to the boiler. The necessary valves for the winter to summer change-over are shown in the diagram.

The amount of condensate handled in the summer on such an application is of course quite small compared with the amount of steam condensate that must be handled during the winter heating operation. For an application of this type, therefore, the capacity of the condensate pump is selected to handle the heating load, and will be more than ample for the dehumidification load in the summer.

As the plant area in the same building is not air conditioned, the ventilation and heating features of the air conditioning unit for the offices were stressed by the owner, with the cooling and dehumidification being considered as more or less "incidental benefits". For this reason, the installation was made in the fall so that its first use would be for wintertime service.

Prior to the office air conditioning installation, the plant area was given attention by insulating its roof with aluminum foil. This has done "a fine job", and resulted in temperatures in the plant "10 or 15 deg cooler than before". Air temperatures in the plant were lower, in fact, than in the offices (prior to the air conditioning installation). The office area extends across the entire eastern exposure of the building.

Condensate pumps of the same type are also used to advantage with the unit heaters in the plant area. A great deal of flexibility in the location of the unit heaters in out-of-the-way places is permitted when the condensate from each is pumped back to the boiler. The photo shows one of the unit heaters in the plant: it is placed conveniently on a shelf where it doesn't interfere with operations.

The Air Comfort Corp., Chicago, installed the air conditioning for the offices.

Remote Control of Piping Processes

Aids Plant Safety

DU PONT CO. employees are just about four times safer at work than they are at home or any place else, even when their jobs call for handling high explosives or volatile chemicals.

The basic principle of the company's safety performance is simple: Safety is the responsibility of management, in all phases and at all levels of organization. Every member of supervision, from the newest foreman to the top level authority, is responsible for the safety of the men and women working with him. Safety practices, subject to continual attention and revision, attempt to anticipate every possible risk that may arise, on the theory that well-trained people, using every available precaution, can avoid all personal injuries.

Built-in safety in plant construction, a wide variety of protective clothing, and many ingenious devices are parts of the mechanics of safety, which have led to the result that only one out of 10 injuries now is caused by failure of equipment or processes; the other nine may be traced to human error.

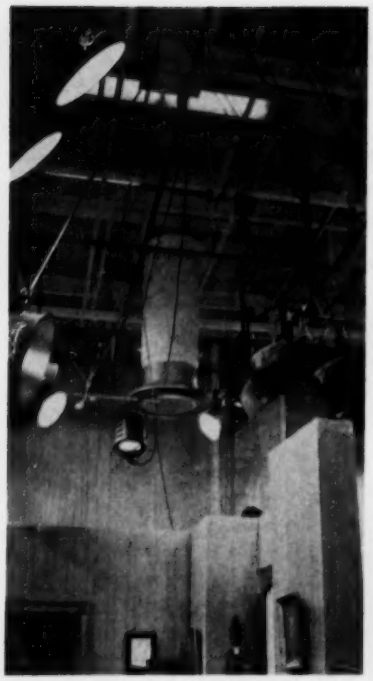
As one example of the program, remote control guides complex operations safely. The photo shows a "Christmas tree" panel board, where tubes trace the flow of product, bells ring and lights flash to indicate interruptions, and delicate instruments record temperatures up to 1000 F, pressures of 10,000 lb per sq in.

Remote control in itself is a significant safety feature, because the operation is physically removed from any hazardous process and is located at a considerable distance from the process in case anything goes wrong.

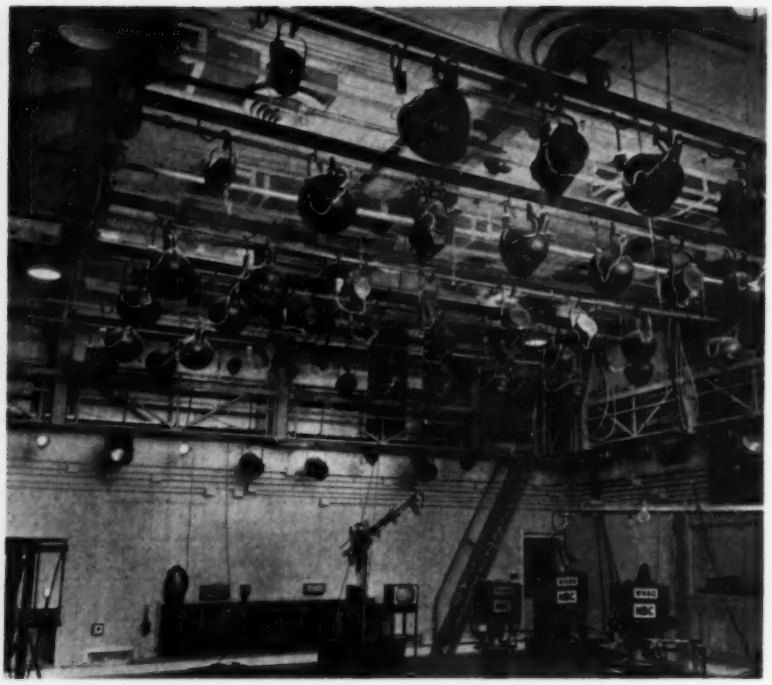
Control through such instruments as control panels eliminates the human element which, unfortunately, is prone to err. The high level of instrumentation involved in this panel board so integrates the process under control that mechanical error is reduced to a degree far less than human error.

Machines and instrumentation do not get tired and sleepy on the job. Human beings are subject to both these states.

The use of instrumentation permits outdoor construction in many of Du Pont's facilities. With no roofs or walls to trap and contain possible leaks of vapors, gases and dust, the possibility of explosions and toxic conditions is reduced. In addition, there are numerous operating reasons why automatic control is indirectly related to safety operations.



A LARGE PRODUCTION TV studio. Note the downrisers



NOTE AIR DIFFUSERS above the lighting level. With this type of air distribution, more air and/or colder air is required

Air Conditioning TV Stations

. . . . presents some tough problems. The author draws on his experience in this work to explain how they've been solved in practice

By F. F. Stevenson

WITH THE AUTHORIZATION of a considerable number of new television channels and stations, consideration of the air conditioning required — in the light of previous experience with other stations — becomes a matter of particular interest.

A large majority of the existing television stations and studios are located in and are a part of large buildings of heavy structural characteristics. Most of the work of installing the studios, apparatus rooms, etc. consisted of remodeling and altering. The air conditioning was of course a part of this work. The trend now, however — particularly for the larger stations — may be toward the erection of new buildings designed especially for television and radio work. Indeed, some of these have already been built.

It may therefore be apropos for the author to draw a few conclusions from the work he has done in the past in the design of television air conditioning systems.

Television stations can perhaps be divided into two categories. First, there are larger ones which put on elaborate shows and productions requiring big studios and lots of equipment space. These will be large structures. Second, there are the smaller stations; many of their programs are piped in from the networks and they require comparatively small space themselves. Such stations often rent space in existing buildings.

Stations in the first classification may be assumed to have high and critical air conditioning standards; they will want the best, and be willing to pay for it. This may not

Mr. Stevenson is a design engineer who has had a wide experience in air conditioning work with several of the large engineering and architectural offices.

A TYPICAL SMALL TELEVISION STUDIO. TV viewers will recognize the setting of the Kukla, Fran and Ollie show

be true in every case, however, and the design engineer should then carefully watch his step. The second class of stations probably will not require such elaborate air conditioning installations; many of them will definitely limit the amount of money to be spent. Here the designer will have to use his ingenuity to provide a common meeting ground for technical requirements and the pocket book. The cooling load in television stations is a critical item, and is "the jumping off place" for the air conditioning designer.

Reduce Solar Load as Much as Possible

As has been noted, television stations have usually been a part of large buildings and so located that outdoor exposure loads were not of great importance. Not always, however — I laid out one system on the top floor of a building where the roof load was quite a factor. But with some of the new stations putting up their own buildings, exposure and sun loads will assume increased importance.

When there is much exposure to the sun, consideration should be given to the time lag of the structural members — particularly when the type of construction is moderate to heavy. For instance, the radiant heat on a south wall or roof may not make itself fully felt inside until late afternoon or evening and radiant heat on the west wall may not assume its full effect on the cooling load until 9 or 10 p. m. In computing solar load, the designer should take credit for every bit of shading effect. If a wall is shaded for a part of the time, there is no reason for charging up the maximum heat gain just because it takes a little time and trouble to compute the shading effect. The same may be said of windows. Many windows — due to the way they are installed — do not receive solar heat over their entire area.

If the roof load is sizeable, the roof should be sprayed. Spraying a roof will cancel the solar load and, if properly done, it will reduce the design dry bulb temperature difference as well. A properly sprayed roof should not have a surface temperature much over 90 or 92 deg when the ambient temperature is 95 deg and the sun is shining brightly on a cloudless day in June or July. A good spraying system doesn't require much water either — usually less than 1 gpm per 100 sq ft of roof area. With pitched roofs, where it is possible to attain a run of thin water film for a considerable distance before emptying to a drain, the water required will be less. Too, a sprayed roof should stand up much better under summer weather than an unsprayed one, for surface temperatures are lower by 40 or 50 deg. Even the best roof construction is affected by prolonged exposure to a temperature of, say, 140 deg and when a thunderstorm occurs in the evening after a hot sunny day, the damage from the sudden cooling is even more pronounced.

Greatest Heat Source Is the Lighting

The greatest source of heat in television studios is, of course, the lighting. During the past few years, however, lighting loads have decreased because, with the new cameras, it is possible to get a good picture with a much lower light intensity.

The air conditioning designer should use every means in his power to divert as much of the production lighting energy as is possible away from the cooling load. With incandescent suspended lamps hung from 12 to 15 ft above the floor, and portable floor lights scattered all over the place, it is pretty difficult to discount the lighting load. Such lights emit about 80 percent of their heat by radiation, the greater part of which is infrared. In one large studio for which I designed the air conditioning, the production wattage amounted to about 25 watts per sq ft of floor area. Other lighting — fluorescent and incandescent — was in the order of about 2½ watts per sq ft. The studio ceiling was high — about 24 ft — as the space occupied two floor levels. The studio management first said that the suspended lights would be kept about 15 ft above the floor level, but this was changed and for many shows the lights are only 10 or 12 ft up. As it is highly desirable to bring in cooling air at a level below the lights, their height is an important item.

Since this installation, I have toyed with the idea of fabricating the downrisers in the form of a sleeve, so that one duct section may be moved up and down inside the other. This arrangement will enable the operators to vary the discharge air height. Or, the downrisers could be

equipped with two air outlets, one at the bottom and the other 5 or 6 ft up, both with manually controlled dampers.

To get back to the matter of how much of the lighting load may be discounted with safety, we may start off with the fact that most of the production lights are directed downward. Thus, it cannot be assumed that much (if any) of the radiant heat is expended to the space above the occupancy level. However, it can be said that some radiant energy will be directed toward the walls and floor and that this energy will be expended in heating the structure and its furnishings. There will be a time lag of perhaps an hour or more before they will be warm enough to begin emitting heat of much consequence to the space, and if the studio were used intermittently, a lag factor of some importance could be applied. Then again, most of the sensible conducted and convected heat charged against the lights would be expended in heating the surrounding air and this heating would be done at the level of the lights. The warmed air would then tend to be well above the occupancy level and to stratify there. Finally, there is the actual usage of the production lighting — is it ever on all at once and if so for how long?

One lighting phenomenon, however, cannot be discounted. That is the radiant heat absorbed by the human body when relatively close to a good radiator, such as an incandescent lamp. Radiant heat will make the occupants feel warm, if there is enough of it around, regardless of the ambient air temperature.

I recall an air conditioned meeting hall designed some years ago when radiant heat was not too well understood. It was brilliantly lighted with a large battery of incandescent lamps placed in the ceiling, which was of considerable height (about 25 ft). The radiant heating effect on the seated occupants was marked. On a hot summer day the cooling system was capable of keeping the hall at 78 deg, but the audience felt warm. Without the ceiling lights, they were entirely comfortable at 80 deg. As the management had spent a large sum of money on the lighting effect, it was not desired to abandon it, so additional sums had to be spent on the air cooling system to increase its capacity so it could hold about 74 deg when the lights were on. Then, everybody was happy. This incident serves to illustrate the importance of radiant heat from lights on the television studio cooling load.

After many discussions with the television engineers it was decided in one case to use an overall factor of 0.70 for the production lights. For the regular lighting, factors of 0.85 for the fluorescent lamps and 0.73 for the incandescent were used. The proportion of sensible conducted and convected heat is higher with fluorescent lamps than with incandescent.

Sensible heat usually is reflected in the cooling load more quickly than is radiant, because it is transferred directly to the surrounding air. By the same token, it may be easier to get rid of — that is, warm air rises and stratifies above the occupancy level, or special ventilation may be used to eliminate a great deal of it. But in this case it was assumed that the sensible fluorescent heat became a part of the cooling load more quickly than the incandescent — hence the higher factor. It may be well to note that if the television engineer is describing his lighting capacity in terms of footcandles, the air conditioning designer should remember it takes about twice as much incandescent wattage per sq ft to produce a footcandle than it does with fluorescent. This does not include the fluorescent ballast, however.

With the above mentioned factors applied, the total studio wattage was about 20 watts per sq ft. This assumption couldn't have been very far off, because the air conditioning system has had no trouble in holding design temperature at peak loads — and there were no large "factors of ignorance" applied to the load calculations, either.

Humen Load Important in Large Studios

The human load is of importance in large studios which stage elaborate shows, with big orchestras, choruses, etc. If there is an audience space in a studio, this part of it may be treated the same as for a movie or theater, assuming say 5 to 7 tons of total cooling load per 100 seats; unless, of course, the load has out-of-the-ordinary aspects which require special calculations.

In small studios, the human load is of little importance.

In large studios, with large choruses, the latent load may be considerable. In the case of the studio in question, the latent figure was taken as 680 Btu per person per hr. Where there is an audience, the occupancy latent load is usually assumed to be from 130 to 180 Btu per person per hr, depending on the dry bulb temperature maintained. However, with the extremely high internal sensible load caused by the lighting, the studio latent load needs little consideration. It is customary to let the latent load ride along with the sensible, assuming that the temperature of the supply air will be quite low enough to handle all dehumidification requirements and more. Separate humidity controls are seldom used.

In the audience section, the latent heat is important and is treated the same as a theater latent load, with separate humidity controls and usually reheat or similar arrangements.

What Design Temperatures Should Be Used?

What design dry and wet bulb temperatures should be used in television work? In making this decision it is well to differentiate between large studios with production shows and small ones, and between studios, office, and apparatus spaces.

In large studios, I have seen dry bulbs running from 75 to 85 deg without complaint from the owners. With the high internal sensible loads, the air volume and movement are high, which helps to achieve a comfort condition when a high dry bulb temperature is used. However, a temperature over 80 deg is not recommended in large studios and 75 deg would probably be better. The same goes for the audience section of a large studio.

The studio control room should be held at 80 deg, if possible, but with a tremendous heat load concentrated in a small space, this temperature may be exceeded.

For apparatus and equipment spaces, the design dry bulb may run from 80 to 85 deg — depending on the internal sensible load.

For the smaller studios, normal comfort conditions are satisfactory, with no need to worry whether the

dry bulb is a couple of degrees higher or lower.

With the exception of the audience section, the wet bulb temperature and the relative humidity can ride along with the dry bulb. A relative humidity of from 45 to 55 percent at the prevailing dry bulb temperature is very satisfactory.

Should the inside studio temperature be varied with the outdoor temperature by automatic control? This question comes up in many other comfort air conditioning installations and the answer is always the same — yes, if the owner wants to spend the money. It is usually well worth it. However, in a large studio with little outside exposure it may be just as well to pick an indoor design condition at peak outdoor temperature and stay with it until the outdoor temperature drops to 80 deg or less. Then the controls can be adjusted for about a 5 deg lower inside temperature.

When large studios — or similar spaces — have intermittent periods of use, some designers use a calculated precooling effect to economize on cooling capacity. The premises are cooled down to a point several degrees below design before the show starts. The walls, drapes, carpets, etc. are also at a temperature below normal and it may take an hour or more to heat them up to design temperature. For this period they become heat absorbers and if the studio operates on a schedule of an hour or two on and an hour or so off it may be possible to do a satisfactory job of cooling with a system capacity smaller than the calculations call for.

In computing the load when precooling is used with intermittent operation, it may be possible to discount the people load by about 30 to 40 percent and the lighting load by about 40 percent. The lighting load should not be discounted if a usage and heat dissipation factor has already been used on it. I have not particularly cared for precooling in air conditioning work, as the premises always seem too cold at the beginning of use. But it has been used successfully many times and would seem to have possibilities with television studios.

Air distribution is a critical item in large studios, control rooms and certain rooms housing apparatus and equipment. Supply air volume is much greater than normal in all such spaces.

Air Distribution a Critical Item

In large studios, supply air must be introduced below the level of the suspended lights or it will lose much of its cooling potential in flowing through the hot lighting area. In the studio about which we have been talking, supply ducts were laid in the furred space above the ceiling and branch downrisers were used to bring the cool air to a level of a couple of feet below the lights. The downrisers are circular in form and each terminates in a ceiling diffuser which has an adjustment to vary the angle of the discharge air stream from 90 deg to about 40 deg. All diffusers were set for a throw of about 40 deg. There is considerable controversy about the ability of ceiling diffusers to produce a downward flow, as some say it is impossible to maintain a stable air stream at the angle just mentioned. Anyhow, the diffusers are doing a good job in this installation.

Return registers were placed on each long side wall at floor level; this is a satisfactory location only if the intakes are kept free and open. After the studio had been operating a few weeks, it was noticed that most of the registers were blocked off by pieces of scenery and other impedimenta. The maintenance men have had to fight a constant battle to keep the intakes open. Another good location for the return intakes is up on the walls at the level of the suspended lights.

Between the lights and the ceiling, there is a distance of about 10 to 12 ft. Warm air flowed into this space and stratified and the temperature was considerably above the occupancy level. To keep the temperature rise down to a reasonable figure, and also to promote the gravity flow of warm air, a constant exhaust is maintained at the ceiling. An exhaust duct was laid in the furred space alongside of the supply duct, with a series of intake grilles placed therein. The volume of air exhausted is about 20 percent of the supply and it was assumed that about 5 percent would be exfiltrated through other outlets, so that outside air for make up purposes was taken as 27½ percent of the supply.

The ceiling exhaust duct was run to an exhaust fan located in a space under the roof about 60 ft away. This distance was needed in order to get enough acoustical duct lining in the run to absorb the noise of the fan. The fan is slow speed, belt driven and is mounted on vibration isolators.

The supply air volume amounts to about 5 cfm per sq ft of floor area, which is a high figure. The number of air changes for the entire space is about 15 per hr, and for the occupied space (that below the level of the lights) about 30 per hr. The air diffusion temperature difference is 22 deg; it could probably have been greater but with downward flow of the diffusers, no chances were taken.

The noise level of the diffusers should be checked before selection. With a 20 decibel total noise level, the diffusers should have a level of not over 16 to 17 db. In smaller studios, wall grilles may be used to supply air provided the required throw is not too great. Long throws cannot be tolerated because of the high outlet velocity required, which raises the noise level.

Return grilles may be placed in the walls at floor level and these should be liberally sized to keep the noise level down.

Cooling Control Rooms a Difficult Problem

Cooling studio control rooms is undoubtedly the most difficult problem encountered by the air conditioning design engineer. These rooms are small, they have low ceilings, the sensible heat load is extremely high, and noise level and air distribution are very critical. It is most unusual to find such a room where the operating personnel do not complain of drafts. I recall one control room, having an area of about 300 sq ft and a ceiling height of 8 ft, 6 in. with a sensible heat load of approximately 34 Btu per sq ft from normal sources and 117 Btu per sq ft from the monitors and tube racks. This amounts to over a ton of refrigeration effect per 100 sq ft of floor area. The total noise level was set at 20 db or less.

The design dry bulb temperature was set at 80 deg with a permissible variation of plus-or-minus 2 deg. Some control rooms use a separate

air supply to absorb the monitor and rack heat (which in my opinion is the best way to handle it). But in this case — due to lack of space and structual limitations — all air was obtained from a common source and introduced into the room through the ceiling. The theory in applications like these is that the supply air will just absorb the normal heat of the space and then be exhausted through the sources of abnormal heat (the racks and monitors). Sometimes it is difficult to keep even temperatures with such installations.

For seven monitors, each having its own fan built in, 1275 cfm was alloted, with a theoretical temperature rise of 13 deg; and for five tube racks, 500 cfm of air was used, with a temperature rise of 33 deg. This made the total supply air 1775 cfm — about 6 cfm per sq ft and 43 air changes per hr. This is a terrifically high air volume, especially when introduced through one source. A separate air supply from underneath the floor, flowing in through the bottom of the monitors and racks and out of the top, would be much more effective in cooling and much easier to handle. The air, in this case, was brought in through perforated ceiling panels, and they do a splendid job under trying conditions. The panels were sized for 11 cfm of air per sq ft of panel area and panel valves were selected on a basis of 150 cfm per valve. This necessitated the use of a lot of panels and valves, but the results are worth it. There are no drafts and the sound level requirement is maintained without trouble.

All supply air used in the control room is exhausted. Exhaust intakes were located above the equipment and a duct run to an exhaust fan some distance away. Every precaution was taken to absorb the fan noise by suitable duct lining, sound traps and fan isolation.

Supply air is taken from a duct supplying the studio and as the air diffusion temperature difference is much less than in the studio, the air is reheated. It was not practical to run steam or hot water to a coil in the control room supply duct, so an electric duct heater was installed. The heater is divided into several sections, each with its own switch, and is controlled automatically by means of a pneumatic thermostat. The branch air line from the thermostat was brought to a number of pneumatic-electric switches, one for each heater section and set to respond to a different branch line pressure in order to give a sequence control of the various sections on and off. An electric modulating thermostat would probably have been simpler to install, but as the main control system is pneumatic, this method is used.

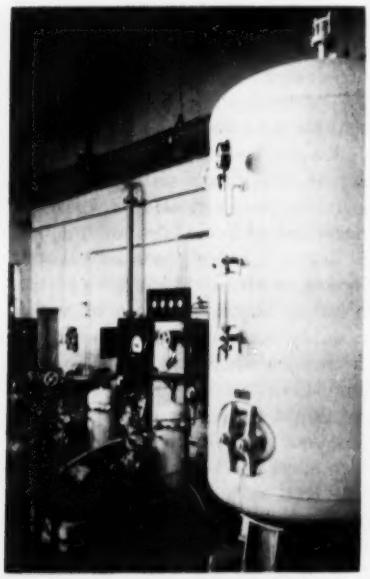
[Mr. Stevenson's next article on air conditioning television stations will discuss — among other things — sound attenuation problems.]

PRESSURIZING HIGH TEMPERATURE WATER SYSTEMS

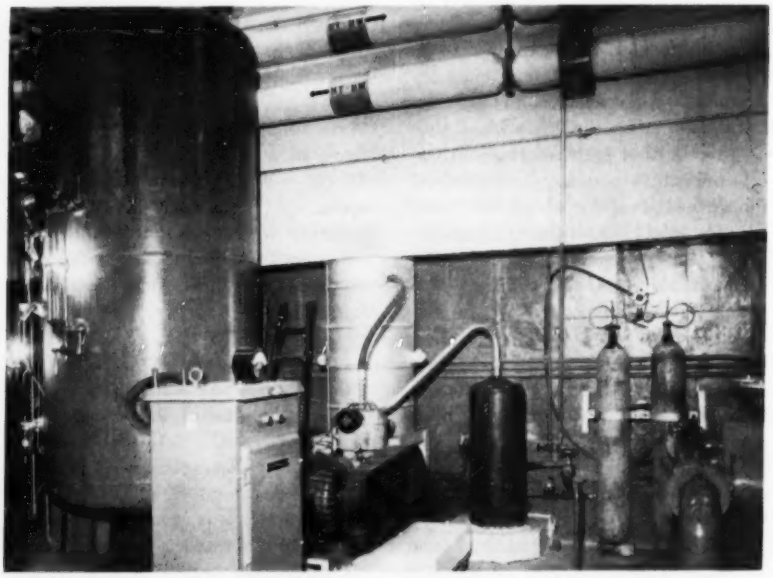
ACCORDING TO HIS comments in the March issue on my article, Pressurizing HPHW Systems with Nitrogen and Other Methods (which appeared in the February HPAC), Paul L. Geiringer can see no need for pressurizing anyway — and, therefore, whether it's done by air or nitrogen does not interest him.

Those who have seen gas pressurized systems at work can state how stable in operation they are and how much more simple, particularly when there is more than one boiler. Thus I do not agree that this method can be dismissed by describing it as a step backward! Surely steam pressurizing came first in the development of HPHW over the past 20 years or so, and the recent adoption of a separate pressure cylinder with air or other gas, acting as the cushion whereby pressure can be maintained constant and not dependent on temperature, is a step forward — not backward.

The supposed "breathing" of air



PRESSURE CYLINDER, air compressor and booster pumps for an HPHW system



NITROGEN FROM BOTTLES at right has been substituted for the air compressor originally installed for pressurizing this system. Pressurizing cylinder is at left. (Ministry of Works photo, Crown Copyright Reserved)

into an air pressurized system is clearly the reason for considering the use of nitrogen. — J. R. KELL, Partner, Oscar Faber & Partners, Consulting Engineers, London, England.

SUMMARIZES FEATURES OF SELF-CHARGING AIR CLEANERS

THE ARTICLE ON Recent Developments in Resin-Wool Air Cleaners, by Howard C. Murphy — published in the April HPAC — is very timely. Many engineers are aware of the need for effective methods of removing fine particles of dust (2 microns or less) from the air and the resin-wool air cleaner offers an excellent approach to this problem.

An excellent and more detailed discussion of the resin-wool air cleaner will be found in the Journal of the Institution of Heating and Ventilating Engineers, (London, England) Vol. 20, No. 201, p. 35, for May 1952, where D. J. Thomas presented technical details in a paper entitled Fibrous Filters for Fine Particle Filtration. This paper was presented at a meeting in London in January 1952, and was so outstanding that it was chosen as the Napier Shaw Premium Lecture.

Utilizing a different medium — shredded polyethylene — an American air cleaner, designed on a similar electrostatic principle, was described at the annual meeting of the American Society of Heating and Ventilating Engineers in St. Louis, January 1952, in a paper titled Self-Charging Electrostatic Air Filters, by W. T. Van Orman and H. A. Endres. This paper was published in the ASHVE Journal Section of the January 1952 issue of HPAC.

The resin-wool air cleaner electrostatic charge radius of action on fine dust has been described as 2/10,000 in., whereas in the self-charging electrostatic filter made in the United States, a 4 in. radius of action has been observed.

The resin-wool filter is vulnerable to minute particles of oil, whereas the self-charging electrostatic filter described by Van Orman and Endres is immune to practically every known chemical.

Reference is made to 99 percent efficiency by the methylene-blue method on ½ micron size particles at a velocity of 14 fpm and a resistance of 0.3 in. of water. It is not clear what depth of filtration is used. Apparently it is considerable.

In the electrostatic air filter discussed in St. Louis, velocities up to 600 fpm are used instead of the 14 fpm for the resin-wool air cleaner. Velocities as high as 1200 fpm have been used successfully on the electrostatic air cleaner.

The resin-wool filter is available only for government use in Europe, whereas in America the self-charging electrostatic air filter is available not only for government use but also for commercial use as well.

The electrostatic approach of either the resin-wool air cleaner, or the shredded polyethylene air cleaner, offers a new and promising method of attacking the problem of cleaning air.—W. T. VAN ORMAN, In Charge of Air Filter Research, Research Div., Goodyear Tire & Rubber Co., Inc.

HANDLING REPAIR ORDERS A "PIPE" BY TUBE SYSTEM

CENTRAL DESK in production office connects with all other stations in the system. The air tube system has simplified the handling of orders, blueprints, etc.

SPEEDY HANDLING of orders — particularly emergency orders for repair parts — was a problem of concern to the Deming Co., Salem, Ohio, manufacturers of pumps and water systems. Installation of an air tube system between the order department in the main office building and the production department across the street has solved many of the problems of speeding up orders, according to the Lamson Corp.

The air tube system runs from the main office building, under the street, beneath the foundry, to the production office where there is a central desk. The production office is connected with the engineering department and two of the subassembly departments by separate lines. The system is used to carry orders, invoices, blueprints and small parts.

Orders for repair and renewal parts come in by letter, wire and telephone. As a result, the fastest possible handling is required. With the air tube installation, the order is written up soon after it is received. It is then dispatched to the production office where it arrives some 200 yards away in approximately 13 seconds. This has resulted in the plant's being able to ship some urgent repair orders on the same day as received. As a result, good relations with customers have been maintained. Emergency repair orders are specially marked.

The system also means a reduced sorting problem since smaller batches of orders are transmited at one time to the production office. The fact that the air tubes connect the production office with the two departments which handle most emergency parts and repairs means that an order can receive almost immediate attention.

After completion, orders are returned to the main office by tube to be turned over to the accounting department for billing.

The system also has simplified the use of blueprints throughout the plant. A request can be sent to the engineering department through the tube. A print is produced and immediately returned the same way.

Orders were formerly carried by messenger. The messenger made his rounds of the various departments. If orders were ready, he picked them up and carried them to the production office. He could only make one round per hour. As a result, there could be considerable delay in transmittal.

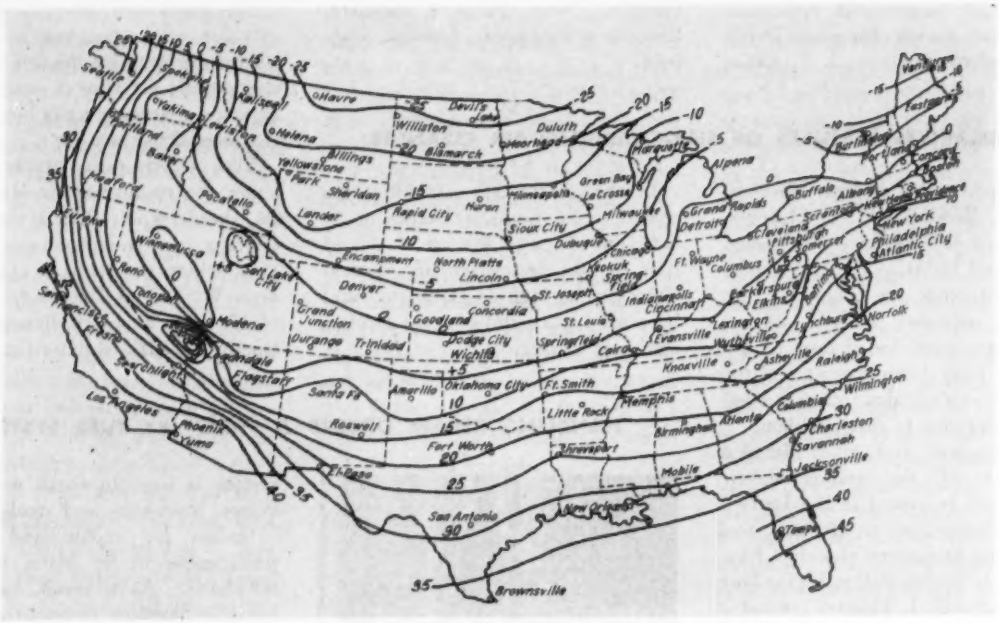


FIG. 1—ZONES OF EQUAL WINTER WEATHER severity are shown by the lines on this map. The figures indicate the daily mean temperatures which can be expected along the respective lines with an average frequency of once a year

Heating Design Temperatures

By A. Donald Hay

Air conditioning and heating engineers depend greatly on the weather. The author continues his discussion of the weather this month by considering heating design temperatures. Later, he will give information on establishing proper design conditions away from weather stations, and will further compare design conditions.

WEATHER INFORMATION in the United States is collected by the Climatological Service of the U. S. Weather Bureau. Forty-five centers collect information from 200 regular observing stations and more than 5000 cooperative stations. Monthly and annual summaries are published in the U. S. Weather Bureau Climatological Data[28] and on microfilm.* These provide an excellent source of data for local weather analysis. Much of this information has been summarized in a form useful to the air conditioning industry by the Carnegie Institute of Technology,[29] by the Marley Co.,[30] by the U. S. Department of Agriculture,[21] and by AIA bulletins.[31] These references give the frequency of occurrence of the different temperatures encountered, and from this information the analyst may choose an appropriate design state for the outdoor air at the nearest Weather Bureau station. He will then either use this design state for his building, or modify it by a knowledge of micrometeorology.

*Superscripts denote references to appear in last article of this series by Mr. Hay.

Comparison of Heating Design Temperatures

Handbooks offer tables suggesting design temperatures and wind velocities at many locations. Table 1 is intended to compare some of these

Mr. Hay has had experience in the advanced engineering section of the air conditioning division of a prominent manufacturer, in the air conditioning design section of a well-known firm of consulting engineers, as a teacher of air conditioning in the school of engineering at Princeton University, and as a senior staff engineer at the Franklin Institute Laboratories for Research and Development.

values for use during the heating season. It must be emphasized that the design temperature for the outdoor air which is finally selected seldom exists. In winter it is a temperature which under steady-state conditions could be assumed to exist outside of the building to give the maximum heating load which will exist for the building, except under the most extreme weather conditions. The actual outdoor temperature varies considerably, both with respect to time and distance above the ground. The actual heat flow is therefore transient rather than steady-flow.

The first column of temperature in Table 1 gives the lowest temperature on record for the airport, which normally is on the outskirts of the city. This temperature is never used as the design temperature because (a) its duration is sufficiently short that its effect is not felt within the building, (b) the wind velocity associated with this minimum temperature is invariably abnormally low or zero, and the resulting blanket or film of air surrounding the building offers more resistance than normal to the flow of heat, and (c) it is uneconomical to size the heating plant for this absolute minimum temperature, for in most cases it would not be disastrous even if the inside air temperature were caused to fall a few degrees in this remote possibility. (In contrast to this, the building must be designed to withstand any wind which might exist even for a few moments.)

The second temperature column gives the design temperatures recommended by a Technical Advisory Committee of the American Society of Heating and Ventilating Engineers and represents an outdoor temperature which is equaled or exceeded during 97½ percent of the hours in December, January, February and March. This means that a total of 72 hr during these four months will have temperatures below the design temperature. The committee believes that the normal building can take care of this without causing discomfort.

The third column of temperature[32] shows the average of the minimum hourly temperatures. This is often used as a design temperature, and it is usually from 5 to 10 deg more conservative than the TAC values in the preceding temperature column.

TABLE 1—WINTER CLIMATIC CONDITIONS in the United States

State	City	Elevation,[a] ft	Lowest temp. on record,[b] F	Design dry bulb temp. on 97.5% basis,[c] F	Wind vel. at design temp.,[d] mph	Av. annual min. temp.,[e] F	Design dry bulb temp. in common use, F
Ala.	Birmingham	615	−10	21	7.4	12	10
	Mobile	219	13	30	8.5	22	15
Ariz.	Phoenix	1112	21	31	5.6	26	25
	Tucson	2561	19	30	6.5		25
	Winslow	4899	−18	6	7.5	− 1	−10
Ark.	Little Rock	282	−12*	21	6.6	10	5
Calif.	Fresno	281	25	32	4.5	26	25
	Oakland	21	25	36	7.5		30
	San Diego	34	34	43	5.8	37	35
Colo.	Denver	5379	−30	0	8.8	−11	−10
	Pueblo	4810	−26	2	6.4		−20
Conn.	Hartford	20	−24	4	8.5		0
	New Haven	17	− 4	11	8.1	− 1	0
D. of C.	Washington	20	−15*	14	7.4	− 1	0
Fla.	Jacksonville	29	16	31	7.0	29	25
	Miami	13	28	45	7.3	38	35
Ga.	Atlanta	1020	− 8	22	10.2	12	10
	Savannah	56	16	29	7.7	22	20
Idaho	Boise	2849	−13	5	4.5	− 1	−10
	Pocatello	4467	−23	6	7.2	−12	− 5
Ill.	Chicago	615	−23*	− 3	11.7	− 8	−10
	Springfield	608	−19	− 2	11.6	− 7	−10
Ind.	Indianapolis	800	−18	2	11.4	− 6	−10
Iowa	Des Moines	979	−30*	− 8	14.5		−15
Kansas	Wichita	1423	−10	6	14.7	− 4	−10
Ky.	Louisville	544	−15	9	8.8	− 5	0
La.	New Orleans	8	19	36	12.8	26	20
Md.	Baltimore	43	− 7*	13	8.9	8	0
Mass.	Boston	45	−14	8	12.3	− 3	0
Mich.	Detroit	632	−24*	4	11.0	−11	−10
Minn.	St. Paul	708	−26	−15	9.9	−25	−20
Mo.	Kansas City	780	−22*	2	10.6	− 6	−10
	St. Louis	597	−19	3	10.8	− 2	0
Mont.	Butte	5538	−52	−18	4.8		−20
	Miles City	2629	−49*	−18	8.4	−30	−35
Neb.	North Platte	2788	−35*	− 9	10.7	−17	−20
	Omaha	1009	−21	− 8	11.5	−14	−10
Nevada	Reno	4417	−16	7	5.6		− 5
N. J.	Camden	20		12	9.5		5
	Newark	15	−14	10	11.6		0
N. Y.	Albany	280	−22	9	9.6	−11	−10
	Buffalo	726	−20*	5	14.0	− 4	− 5
N. C.	Raleigh	446	− 2*	20	8.5	13	10
N. D.	Bismarck	1655	−38	−24	7.1	−31	−30
Ohio	Cincinnati	488	−14	7	8.0	− 2	0
	Cleveland	813	− 5	6	13.8	− 2	0
Okla.	Oklahoma City	1311	−10	14	14.7	2	0
Ore.	Baker	3374	−19	5	6.4	−17	− 5
	Medford	1343	− 5	23	4.3		5
	Portland	25	5	22	8.0	18	10
Pa.	Harrisburg	339	−14*	7	9.0	3	0
	Pittsburgh	1284	−16	6	12.1	− 2	0
S. C.	Charleston	51	14	26	6.9	22	15
Tenn.	Memphis	267	1	19	8.9	9	0
	Nashville	610	−15	14	7.3	5	0
Texas	Amarillo	3595	− 7	11	12.9	0	−10
	Dallas	520	5	23	8.8	13	0
	El Paso	3956	11	26	8.6	16	10
	Houston	73	5	33	9.2	22	20
Utah	Salt Lake City	4254	−30	7	7.4	− 2	−10
Va.	Richmond	172	−12	15	7.1	10	15
Wash.	Seattle	47	3	24	6.3	20	15
	Spokane	1974	− 7	4	5.1	− 5	−15
Wisc.	La Crosse	677	−28	−17	6.9	−21	−25
	Madison	884	−29*	− 8	9.1		−15
Wyo.	Cheyenne	6161	−34	− 3	11.1	−18	−15

[a]Elevation of airport above sea level.
[b]Dry bulb temperature of airport. Period of record is shown in the ASHVE Guide 1949.
[c]The temperature shown is the minimum hourly outdoor temperature which has been equaled or exceeded 97.5 percent of the total hours in December, January and February for the period of record. It is recommended by a Technical Advisory Committee of the ASHVE and is based on weather at the airport.
[d]Wind velocities are measured at the airport.
[e]Average of readings of one lowest temperature obtained for each year.
*Reported at the city office station. Airport reading unavailable. Data selected from the ASHVE Guide 1949.

A similar method is presented in Fig. 1, where the isotherms represent daily mean (midway between maximum and minimum) temperatures which occur once a year, rather than the minimum temperature. The daily mean values are very close to the TAC recommended design temperatures.

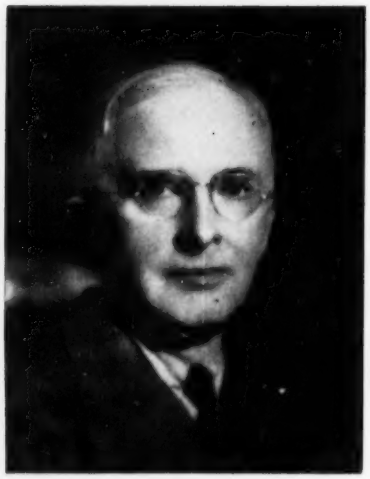
Oldest Method of Selecting Design Temperatures

The oldest method of selecting design temperatures is shown in the last column of Table 1. This value was usually determined by adding 15 deg to the lowest recorded temperature and then rounding it off to the nearest 5 or 10 deg. This results in a design temperature approximately 10 deg more conservative than the TAC temperatures.

[Mr. Hay's article in the March HPAC discussed measuring the weather, and in April he wrote on the energy from space and what becomes of it. Future articles by him will be devoted to climatology of the United States, micrometeorology, and analysis of weather conditions to achieve air conditioning economy.]

SAM LEWIS

You Simply Must Supply Air for Combustion



SAMUEL R. LEWIS, consulting mechanical engineer and a member of HPAC's board of consulting and contributing editors, comments informally each month on practical heating, piping and air conditioning problems.

THIS IS ABOUT a building heated by a "down-blowing" warm air furnace. The fuel is natural gas. A motor driven centrifugal fan is built into the furnace above the heated surfaces. The direction of air flow is downward around the heating element to depart through metal ducts in the shallow crawl space between the ground and the first story joists. These ducts deliver the air through grilles in the floor around the exterior walls.

The furnace is located in one corner of the large room. Air supply to the fan passes freely across the room from the warm air supply grilles, without any ducts. A conventional wall-mounted thermostat stops and starts the fan motor and a second thermostat in the warm air duct may shut down the fire when the fan stops running.

The construction of the building is ordinary, with an inch of insulation under the composition roof, but without any watertight vapor barrier between the insulation and the air of the room. There is a low chimney, lined with material that is resistant to disintegration by water or by frost. The breeching from the furnace, designed to take away products of combustion, has an ordinary draft hood, open into the whole room.

There is strong competition for air between the gas burners in the furnace, a separate chimney from a hooded process heater, and an exhaust fan discharging out-of-doors from this hood. The walls and windows of the room are new and are unusually leak resistant.

All Sorts of Troubles

Complaint was made of frost-covered windows, of water dripping from lighting fixtures, and of water-stained walls. The composition roofing was about to give up the ghost and when one walked on it, streams of water squirted up through newly burst holes.

Investigation disclosed that the insulation below the alleged watertight top was a water-saturated sponge that had picked up the moisture from the under side, exposed to the dampness of the room.

Our first inquiry was, Whence comes the air required to form a chemical combination with the natural gas so that the resultant heat and water vapor could appear? The room proved to be very badly air-starved. The products of combustion, largely H_2O, were being drawn into and across the room by the exhaust fan and were being recirculated around and around by the furnace fan and invited to condense against the cool surfaces of this room.

The fact that enough gas could be burned to make the water vapor was accounted for by the air pulled into the room down through the two chimney vents. The warm, damp mixture of air and gas and low pressure steam, on passing the cool windows and chilly ceiling and walls, condensed — just as dew condenses on cool surfaces on a summer evening.

On opening a window, the air rushed in, the water ceased dripping, and the place soon dried out.

Lesson Constantly Being Re-Taught

This sort of lesson constantly is being re-taught when we observe black-smeared chimney tops — usually evidence of deficient boiler or furnace room air supply. One advanced municipal smoke prevention department head likes to be assured that the heat release per cu ft in a boiler combustion chamber is conservative, but becomes positively militant when he fails to find a hole in a boiler room wall at least as big as the hole in the chimney, and through which air freely may enter to mix with the carbon in the fuel and so promote smokeless combustion.

What's the Fair Value of a Used Air Conditioning System?

WHILE THE FOLLOWING case does not definitely fix what might be legally termed the "market value" of used air conditioning equipment, it certainly tends to clarify the question. Perhaps the most valuable lesson is the necessity for a tenant to have a clear agreement with his landlord concerning the price in case a sale is made to him at the expiration of the lease. The contractor can be of real service to his customers if he is able to advise the tenant-purchaser on the tricky points of such an agreement.

The plot of our subject case revolves around four successive leases, all expiring May 31, 1954, and certain agreements. The chief characters are two insurance companies (whom we'll designate Life and Casualty) and the original lessor, one Adam.

Three of the leases provided that Casualty might — with Adam's approval — install at its own expense electric fixtures and air conditioning equipment, pay Adam for current consumed, and have the right to remove its installations upon termination of the leases. Adam, it was further understood, was to "bear no costs under this paragraph".

The fourth lease, and an amendment to the first three leases, provided however that all fixtures and air conditioning equipment installed by Casualty should at the time of the leases' termination be purchased by Adam, who "agrees to pay" Casualty "therefor the reasonable cash market value of such fixtures and equipment in their then depreciated condition."

Five 15 ton package type air conditioning units were installed by Casualty during its tenancy under the several leases, at a reported cost of $35,408. This sum was in addition to about $11,000 worth of electric fixtures.

Building Sold To Another Insurance Company

In January 1949, Adams sold the building to the Life Insurance Co. By mutual consent, all the leases were terminated on June 1, 1950. Life and Casualty being unable to agree on the price to be paid for the air conditioning system and fixtures, arbitration was waived and suit was filed by Casualty.

The trial court awarded Casualty $24,939. Life, carrying the case to a higher tribunal, briefed its successful appeal for a re-trial under seven points, contending that —

1) The provision for purchase of installations was not "a covenant running with the land".

2) The price paid should be not for the installed value to the user, but should be the value if removed and sold in the open market.

3) The trial court should not have allowed Casualty to recover judgment on a "cost-plus-depreciation" formula.

4) Judgment should not have been for "direct work and other installation items" that had been "affixed to realty and become part" of the lessor's property;

5) The amendment was not retroactive and did not purport to change existing property rights.

6) There should have been no recovery for labor and material involved with the installation of the air conditioning equipment. The contract was that the lessor (Adam) would pay no part of the initial cost but would pay only for the equipment and fixtures.

7) "Reasonable cash market value", as used in the contract, meant what is expressed in the usual definition of market value — not such price *plus* the cost of installation in the building.

Opposing these points of appeal, Casualty took the position that the reasonable cash market value of the air conditioning equipment and electrical fixtures was $35,917. This value was for their then depreciated condition but as functioning in the building — not as detached therefrom.

What the Court of Appeals Thought

The state's civil court of appeals, disagreeing with point (1), ruled that "the covenant ran with the land" because "the installations were, if not in fact improvements, analogous thereto." The court took cognizance of the fact that the air conditioning equipment was "elaborate, but whether a real fixture or not, was

[*Concluded on page* 110]

William Hurd Hillyer, author of this article, is a contributor to a number of banking and financial publications and has written several books on business. A former vice president of the Atlanta Trust Co., his work there gave him a practical legal background.

ANYTHING CAN HAPPEN

"VIBRATION Is a Trouble-Maker"

By Bill Dopp

• *Almost anything can happen when you're in the engineering, operating, contracting or sales ends of the heating, piping and air conditioning industry. The objective of this more-or-less regular editorial feature in HPAC is to discuss practical problems that need solving — and ways to solve them.*

Bill Dopp worked for Crane Co. for more than 40 years — all of that time dealing with piping and including a long stretch of service as a sales engineer. We hope he'll devote more of his Arkansas leisure to draw on his many piping experiences, as he does in this story.

WHEN YOU ENTER a power plant, you are instantly aware of a sustained noise pervading the entire structure. To the practiced ear it is a musical note that murmurs "All is well." But lurking under that high-pitched note there may be danger . . . . even disaster.

Martin MacVane slowly made his way up the hospital-clean stairway, enjoying the comfortable power plant hum. Finally he appeared in the doorway of the Chief's office.

Tom Weaver, chief engineer of the Utilities Power Plant, stood behind his desk, frowning. His assistant, Bob Stringer, exclaimed, "Oh! Oh! Look who's here!" His ruddy face had a grin from ear to ear.

Tom Weaver, a broad grin lighting his face too, looked up. Sarcastically he declared, "Well, if it isn't Mr. Gasket himself."

"Hello, Tom. In trouble?", said Mac.

"You're darn right I'm in trouble. Bob, get those gaskets we took out of that boiler feed line yesterday." Waving his helper out the door, he turned on his visitor, pointed an accusing finger: "You sold me those gaskets. They're the best gaskets made. I'll never have any more gasket trouble. Oh, no!" His big hands spread out on the desk like fans as he leaned toward his caller.

The smile that spread over the face of the salesman seemed to infuriate him. "I'll never use any of your lousy gaskets again," he exploded.

"Want to bet?" replied Mac in his slow and easy drawl.

Before Tom could find an answer, Bob came in with a handful of mutilated asbestos ring gaskets, dropped them on the desk. "Look," said Tom, "We put up a new boiler feed line. In a week, half a dozen joints were leaking. So we replaced the gaskets. Worked all Saturday night and half of Sunday. In less than a week that blasted line is leaking again."

Mac had not moved since he had stopped in front of Tom's desk. He hardly looked at the gaskets. "Better sit down and relax," he suggested. "Here, light up and let's talk this thing over."

"Let's start over," said Mac. "You put up a new boiler feed line. When?"

"About two months ago," replied Tom.

"Pull up the joints alternate bolts across the center?"

"What kind of dubs do you think we are, Mac?" Tom was offended. "Every joint was properly pulled up and the bolts evenly stressed."

"What pressure and temperature?," Mac wanted to know.

"450 pounds, 350 degrees." Tom was showing impatience.

"Were any of the nuts loose when you examined the joints, after they started to leak?"

"No." Tom hesitated, "By George, there were a couple of the nuts you could turn off by hand, come to think of it. Why?"

"Vibration," said Mac softly. "Vibration, sure as you're born."

"Vibration my eye," declared Tom. "That line is as quiet as a concrete foundation."

"Leaking now?", asked Mac.

"Sure is." Tom got up. "Come on, I'll show you."

As they made their way through the power house down to the pump room, the keen eyes of the packing salesman didn't miss a thing. The polished trimmings, the gleaming floor, even the clean windows of the immaculate turbine room underwent a critical inspection. He didn't fail to note the dustless handrails as he went down to the lower levels of the plant. "Nice housekeeping," he said into Tom's ear as they approached the pumps. Tom smiled — the compliment pleased him.

"Take a look at those joints." Tom pointed to the header above the pumps. "And look here, the joints around these valves are beginning to go, too. Every bit of that covering is ruined. We'll have to re-make every one of those joints."

Mac's eyes were traveling over the pipe line. He turned to Bob, who had followed along, and asked, "Can you get me a glass of water?"

Bob cast an inquiring look at Tom as if to say, "Is this guy nuts?", and turned away to comply with the strange request.

Mac put his left hand on the handwheel of one of the valves. Tom followed suit. "You can't feel a thing," he declared. "There's no vibration here. That pump runs smooth as a watch."

Mac nodded and reached for the glass of water Bob held out to him.

"Look," he said, as he carefully balanced it on the edge of the valve bonnet. For a moment nothing happened. Then a faint ripple appeared on the surface of the water. Gradually it grew more noticeable and became quite violent. Suddenly it stopped. All were watching it intently. The ripple started again,

came to a peak and abruptly stopped. "Vibration," said Mac.

Tom nodded doubtfully. "But from where?", he asked.

"Cantilever," replied Mac. "See that ripple come up to a peak and suddenly dampen off? That's the way a horizontal beam fixed at one end would act. When it starts to vibrate up and down, the movement is the same in both directions at first. The weight of the beam begins to lengthen the downstroke until the unbalanced movement dampens out the upstroke. Then the vibration stops, to begin all over again."

"Well, I'll be a monkey's uncle," declared Tom. Bob's grin was all over his face.

"It's something like running your finger down a guitar string to raise the pitch of the note. It finally stops the vibration altogether."

They followed Mac's glance as he surveyed the line thoughtfully. "Let's see if we can find the trouble." He started along beneath the line, Tom and Bob following. About 50 feet from the pump, Mac stopped. "There it is." He looked up. "That nice, long, sweeping bend up there. That's your cantilever."

"Wait a minute," exclaimed Tom. "How do you make that out?"

"Well, look at that bend. It's at least an 8 foot radius. Four inch pipe, isn't it?"

"Yes." Tom was still doubtful.

"All right — now look where you've got the hangers. Both are at least 16 feet from the crossing of the center lines. Run a chalk line between those hangers and you'd see that the bend really is a cantilever as long as the distance from that line to the center of the bend."

"You mean that acts like a beam fixed in a wall?," Tom asked.

"That's it exactly," replied Mac.

"But what makes it vibrate?," Tom wanted to know.

"Two things," explained Mac. "The plant vibration and the local or line vibration. You know that every plant has a key vibration note. If that note suddenly changes, you know at once that there is trouble ahead. Now the key note is made up of local notes from various parts of the plant. This pump level has a note of its own. This note is produced by the pumps, the heaters, the turbine foundation and what not. It contributes to the overall station note. You know, of course, that every sound is the result of vibration."

"Yes, but . . . ." Tom interrupted.

"Just a minute," said Mac. "Now the other source of vibration in the bend is because of the movement of the water in the pipe."

"Hold on," Tom put a restraining hand on Mac's shoulder. "Those pumps don't produce any vibration; they're centrifugals."

"Oh, yes, they do. You can't hear it, but it's there just the same. Besides, the water going around a bend creates turbulence in the pipe. It gets into a spiral motion that doesn't straighten out until it gets well beyond that downside hanger."

"Does that really create vibration?," Bob wanted to know.

"All motion is vibration, Bob." Mac declared. "Moving water sets up vibration in the pipe and when the rate of vibration gets to where you can hear it we have a definite audible note called a resonance. The flow of water seldom creates resonance, but the flow of steam or air often does."

"You can't hear anything in that bend," said Tom. "How do you know there's vibration there?"

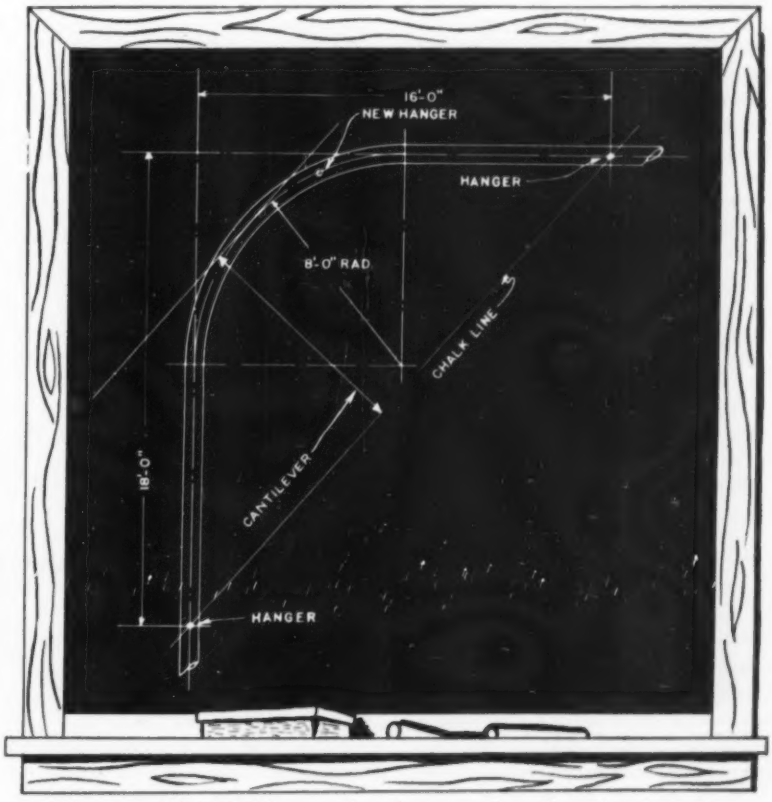
"True, you can't hear it, but you do have a harmonic motion there. Let me prove it." Mac turned to the intensely interested assistant. "Bob, will you get me a piece of rope long enough to go over that pipe and a flange or any kind of a weight that we can hang onto it?"

"Okay," said the young man as he left on the run.

"This is darned interesting," said Tom. "You think this bend is responsible for our leaking joints?"

"Sure is," declared Mac. "Here comes Bob. We'll soon see if I'm right." He turned to Bob. "Throw the rope over the center of the bend, Bob, and tie that flange to the ends so that it hangs about a foot from the floor." Bob did as directed and in a few minutes Mac was satisfied. He eyed the bottom of the flange critically and motioned toward the pumps.

"You remember how the ripples on the water appeared and faded out," he said to Tom. "Let's see what it's doing now."



"RUN A CHALK LINE between those hangers and you'd see that the bend is really a cantilever," said Mac.

They walked back to the pumps, Mac setting a slow pace. All eyes intently fixed on the surface of the water. It was perfectly quiet, and remained so.

"See any ripples?," asked Mac.

"I'll be darned," exclaimed Tom. "Why did that weight stop the vibration?", Tom asked — for Bob's benefit.

"We've changed the weight of the cantilever so that the downstroke has overcome the harmonic and that prevents the bend from getting into motion," Mac replied.

"What do we do now?," asked Tom. "We can't leave that flange hanging on that pipe."

"No," answered Mac. "You just change the position of those hangers or add a new one. Anything to break up the cantilever action. You'll have to tighten up those joints, though. I don't think the gaskets have been seriously damaged. They should hold once the vibration has been stopped."

"Well, we sure learned something today, didn't we, Bob? In fact, we always do when Mac comes around," said Tom. "And you'll get your order, too," he smiled at Mac.

"Thanks", said Mac. "But don't forget that vibration is often a trouble-maker."

THE LAW AND YOUR PROFITS —

[*Concluded from page* 107]

made subject to removal and sale on termination of the lease." The majority opinion favored the Life Insurance Co.'s other six points of appeal.

Here, in plain language, is the higher tribunal's reasoning:

By means of the amendment, Life bound itself to pay for equipment and fixtures, which were then the property of Casualty. Casualty gained by this amendment the binding *contract* of Life to purchase — Life, on the other hand, gained the *right* so to purchase.

The Life Insurance Co. had been ordered by the trial court to pay, not the "cash market value", but the *peculiar* value that the installations had for the Casualty Insurance Co. This, in the higher court's opinion, was not the price that Life had contracted to pay.

Expounding this statement, the higher court went on to say: "*In place*, unless coupled with the right of removal", the installations "could have no market value," and "no one could purchase same from lessor", that is, Life. Nor was the peculiar installed value to the lessee of the building the price the lessor agreed to pay.

What the installations "attached to the building would bring on the market" was seen by the higher court as the "exact formula". The majority opinion repelled Casualty's equation of cash-market-value, minus depreciation, equals value of equipment and fixtures *in place*. "Such a standard could not represent true market value" of the installations but would be "the value with reference to their uses in connection with this building alone."

If such principles were generally adopted, opined the chief justice, "there could be no value to anybody other than the owner of a building or the tenant of the owner."

Vigorously Worded Minority Opinion

One of the justices dissented from the majority view. His vigorously worded minority opinion declared: "In the building, these fixtures or equipment unquestionably had a value far in excess of the salvage value they would have had if removed and on the market." They "unquestionably *enhanced the value of the building* to anyone in the market for its use." The dissenting justice deemed it "incongruous to distort this value into a value" which the installations "would have if removed", for the parties "clearly contemplated" that they should *not* be removed.

However, he joined the majority in agreement to let the case go back to the lower court for re-trial, solely because under the terms of the agreement the value of "permanent" ducts and conduit wiring could not be correctly ascertained from the record.

Where Doctors Differ, Lessons Are Learned

Where doctors (of law, or other professions) differ, lessons may be drawn from such differences.

From the majority view in this case emerges a cautionary signal. If, as that view implies, air conditioning equipment's "fair market value" does not include what it is worth in place to the owner or the tenant of the building itself, the seller and installer of that equipment may face a legal hazard.

On the other hand, should subsequent court decisions tip the scale of precedent in favor of the minority opinion, then a basis will be gained for valuation of an air conditioning system as enhancing the true worth of improved real estate.

[Note: While this discussion applies to an actual case, it should be remembered that legal rules vary in different states.]

SEES MORE WOMEN IN KEY ENGINEERING JOBS

WITHIN THE NEXT five to eight years, women must be expected to play an increasingly important role in key engineering and technical capacities, according to J. J. Thompson, manager of the personnel and training division of the Worthington Corp.

Talking before a group of Worthington product division managers and top level executives at a national conference in East Orange, N. J., Mr. Thompson said that "the time has now come when women who have mechanical leanings or technical abilities should seriously consider engineering as a career. Their opportunities for advancing in technical positions are increasing daily, and old prejudices due to their sex are rapidly melting.

"Over the years," he pointed out, "women have made outstanding contributions in technical endeavors that were once considered only for men."

QUESTION OF THE MONTH

IF YOU DON'T HAVE the answer to a problem, chances are someone else does — or can be helpful on part of it. That's the reason for HPAC's Question of the Month "idea exchange." You are invited to contribute a question for publication, or an answer to a published question. . . . . Please address your reply to the Editors, Heating, Piping & Air Conditioning, 6 N. Michigan Ave., Chicago 2.

Follow Good Piping Practices When Installing Snow Melting Coils

IN A QUESTION published in the April HPAC, a reader asked about the protection of snow melting piping against corrosion. He said that evidences of exterior corrosion had been found after three or four years of operation — both in piping in a reinforced concrete slab, and in piping laid on crushed stone over which concrete was poured. He said that one explanation was that there was severe electrolytic action present which caused wasting away of the metal.

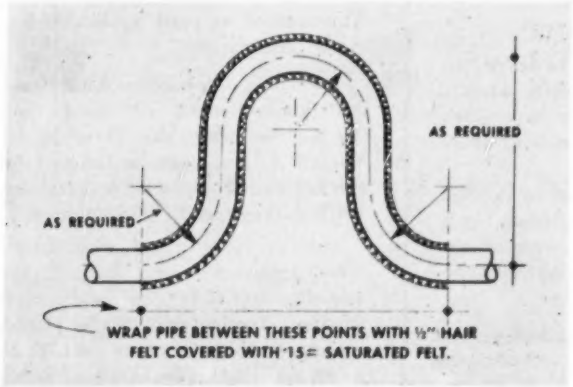
Proper installation of snow melting piping to meet the conditions encountered in a particular area is the best method of avoiding difficulties. Complete embedment of the piping in good concrete over a crushed stone or washed gravel fill that is properly drained is essential. Concrete as generally used for structural purposes and composed of the proper portions of gravel, sand, cement and water is considered good concrete. The use of cinders or other materials — such as calcium chlorides or ocean sand carrying chlorides — is to be avoided. If ground water conditions or the grade of the slab is such that water from melted snow can rise in the fill and be in contact with the slab, a moisture barrier should be provided to avoid this condition.

In its booklet, Steel Pipe Snow Melting and Ice Removal Systems, the Committee on Steel Pipe Research of the American Iron and Steel Institute gives these installation suggestions:

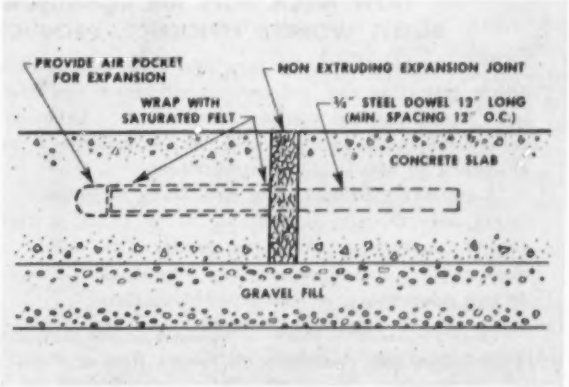
"It is important to follow the standards of good piping practice throughout the installation of snow melting system coils. Piping should be supported in such a manner as to provide for its proper position in the slab when the concrete or black top is placed, and to insure complete embedment of the pipe in the slab.

"Supports used to keep the pipe raised or in position should be of a non-absorbing character. Concrete or steel stools are recommended. In other words, bricks, soft stones, wood blocks, etc., should not be used, since they can absorb moisture from the ground, including certain chemical agents that may be present in the soil and thus reach the pipe, creating a potential deteriorating condition. In fact, the same care must be used in protecting the pipe at these positioning points as with the main body of the coils proper. When the coils are leveled prior to embedment, it is a rather simple process to support the pipe at proper intervals with stools of a proper mix of concrete and sufficiently firm to maintain the level.

"The top of the pipe should be a minimum of 2 in. below the surface of the slab and the bottom of the pipe should be a minimum of 2 in. from the bottom of the slab, completely surrounded with concrete at all points to prevent ground water from coming into contact with the pipe. In no instance should the pipe be allowed to rest on the soil beneath the slab, or on sand or gravel. It is important to also properly protect the supply and return mains which lead to the snow melting area. This protection may be in the form of concrete or bituminous material, together with an insulating jacket where it is desirable to reduce heat losses in these lines. In either case, the area should be properly drained and if moisture is still likely to accumulate near the slab, a moisture barrier should be used to prevent moisture coming into contact with the pipe. The surface on which this barrier is laid should be sufficiently smooth to avoid puncture of the barrier. This barrier can be a layer of hot



EXPANSION LOOP


PROVIDE AIR POCKET FOR EXPANSION
NON EXTRUDING EXPANSION JOINT
WRAP WITH SATURATED FELT
½" STEEL DOWEL 12" LONG (MIN. SPACING 12" O.C.)
CONCRETE SLAB
GRAVEL FILL

EXPANSION JOINT AND DOWEL

coal tar on which a layer of 45 or 55 lb smooth surface roofing material is laid with overlapping followed by a flush coat of hot coal tar. Strict inspection should be maintained to see that the barrier is not punctured by subsequent workmen.

Provide the Proper Air Venting

"Where piping is graded, proper air venting must be provided at high points, since the complete elimination of air is necessary for correct operation. Similarly, it is desirable to provide drainage cocks at the low points, in case it is found necessary to drain the system.

"The installation of a snow melting system in a sidewalk or driveway introduces no new expansion problems. The temperature of the slab when the snow melting system is in operation is even less than that caused by the summer sun. For this reason, expansion joints in the slab closely follow standard positioning, and where piping passes through these joints, expansion loops are installed when required, wrapped with wool felt, or other soft material properly protected against moisture, to allow movement. In some cases, bellows-type expansion joints have been used. Adjacent slab sections should be dowelled to prevent a vertical displacement at the expansion joint in the slab.

"It is important to test the pipe system thoroughly before it is enclosed in concrete. Ordinarily, a 125 lb cold water test, which is well below allowable working pressure for steel pipe, is applied for several hours. A limiting factor in this test is the design pressures to which valves and fittings are made. Immediately after pressure is applied, each joint should be rapped with a hammer. In severely cold weather, it may be necessary to use a comparable soaped joint air test instead of the cold water test."

It is possible that piping supposedly completely embedded may be exposed at certain points to moisture or soil that is corrosive, so the necessary steps to insure proper embedment are essential.

The reference in the reader's question to electrolytic action is assumed to mean stray current electrolysis. In any area where direct currents are likely to be picked up, trouble is possible particularly if the coils are not completely embedded and leakage of this current to the earth from coils in the slab takes place. Complete embedment of the coils in the slab and insulating connections to the slab usually eliminate this condition. Proper protection for the feed and return lines to the embedded coils should also be provided.

It is possible to apply cathodic protection to those systems that may not have been properly installed or where unusual conditions are encountered. However, cathodic protection if applied should be done under the supervision of organizations qualified to properly install such methods.

With a welded pipe system properly installed and tested, the likelihood of pipe failure is very remote. — GEORGE D. LAIN, Research Engineer, Committee on Steel Pipe Research of the American Iron and Steel Institute.

HOW MUCH DOES AIR CONDITIONING BOOST WORKER EFFICIENCY, PRODUCTIVITY?

"I remember that some time ago there was published in HPAC an article reporting the increases in efficiency and productivity when a large drafting room was air conditioned. Other articles have given similar information — although not as complete — on increasing office efficiency by means of air conditioning.

"I am trying to find more data along these lines — that is, to what extent does the air conditioning of an office, a drafting room, or a similar work-space affect the productivity or the efficiency of the occupants? I'd appreciate any comments in answer to my question, or any references to available published data."

[You are invited to answer or comment on this question for publication here. Please address your remarks to the Editors, Heating, Piping & Air Conditioning, 6 N. Michigan Ave., Chicago 2.]

COUNTER-ACTING COLD AIR AT LARGE DOORWAYS

IN ANSWER TO THE question published in the March HPAC, the problem of preventing cold air flow through large doors is one of considerable complexity. A method ordinarily employed is to use ceiling suspended type unit heaters to direct heated air down in the area of the open doorway. This method meets with varied success, depending usually on the size of the door opening. When the door opening is relatively small, this method is usually quite efficient.

Another scheme is the use of high velocity unit heaters. These are usually placed at the ends of the doors with the discharge nozzles parallel to the door opening and discharging the heated air directly across the door opening.

A third method, which has proved quite successful in arch door openings similar to those in aircraft hangars, is to install a duct below the floor approximately 2 ft inside of the door opening. High capacity unit heaters are connected by means of ductwork so that the heated air is pumped down into this lateral duct. Slotted openings along this duct permit a high velocity jet of heated air to effectively blanket the entire open area of the door. This method takes advantage of the natural convection current of heated air, as the air is directed from the floor toward the ceiling and effectively mixes with the inrushing cold air to prevent this cold air from chilling the area surrounding the door.

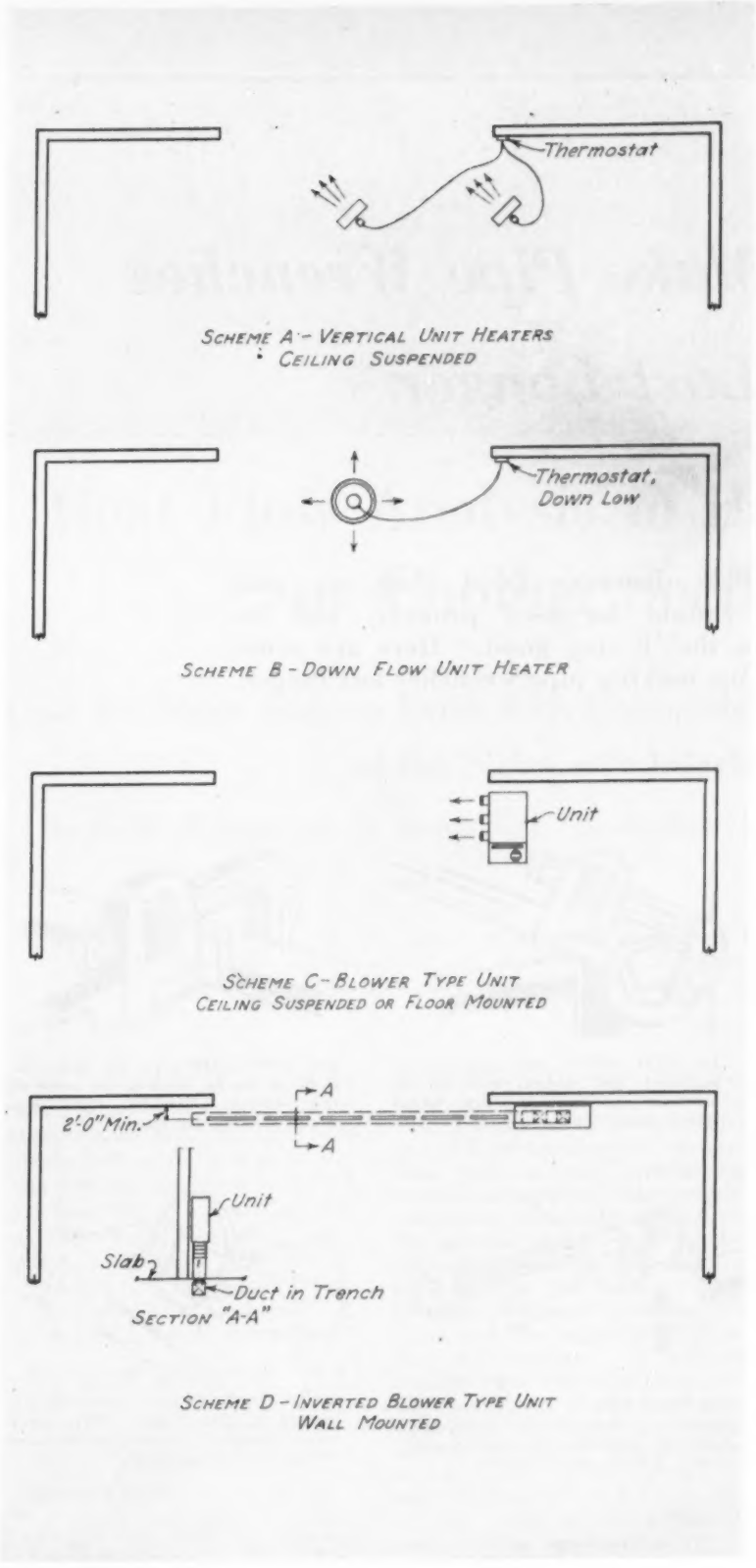
The accompanying sketches illustrate these various schemes.

Sketches Show Methods

Scheme A—Vertical Unit Heaters: This method is most applicable for a low ceiling room.

Scheme B—Horizontal Unit Heaters: Very effective with doors that are not too wide, say 25 to 30 ft. Special diffusers can be fastened to the bottom of the unit to vary the vertical throw and diffusion area.

Scheme C—Vertical Fan Unit: Good results with this method; especially effective for doors wider than 30 ft. Another unit can be placed at opposite side of doors over 40 ft wide, with discharges blowing toward each other.



HERE ARE SEVERAL METHODS suggested by Mr. Feder for heating large doorways to prevent chilling when the doors are opened

Scheme D—Floor Duct: Velocity through slot should be a minimum of 1000 fpm. Removable sections will facilitate cleaning the trench. — NATHAN FEDER, Chief Engineer, J. M. Fink Co., Inc.

REMEMBER: COOL AIR FALLS, WARM AIR RISES

COOL AIR FALLS and warm air rises — and the air conditioning engineer mustn't forget that this is so, it was indicated in a talk last month by Samuel R. Lewis. Mr. Lewis — consulting mechanical engineer, member of HPAC's board of consulting and contributing editors, and author of HPAC's monthly Sam Lewis' Page, spoke at the April meeting of the Chicago section of the American Society of Refrigerating Engineers.

In discussing "applied refrigerating engineering", he cited a number of installations that presented problems and how they've been corrected. One is an air conditioned building devoted to research, each story comprising not only the main floor (rectangular in shape) but a circular balcony as well. Even though there are separate heating and cooling controls for both main floor and balcony space of each story, cool air spills over the circumference of the balcony and makes the main floor space too cold. Warm air from the main floor overheats the balcony.

Mr. Lewis said that some sort of plastic or glass barrier around the perimeter of each balcony will have to be put up to prevent the trouble.

Several of the other cases he mentioned stressed in general the importance of ventilation air, use of reheat, and thermostatically controlled radiation in the various rooms or spaces supplied from one central air conditioning system.

A problem of a different kind came up with an air conditioned building which uses cold ground water pumped through the coils for cooling and dehumidifying the air. The water is then sprayed on the roof, and disposed of through the downspouts to the sewer. The downspouts quickly became clogged with an algae growth. The trouble was corrected by chlorinating and chemically treating the water.

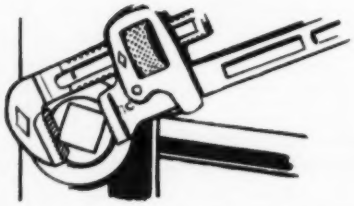
At the business session prior to Mr. Lewis' talk, James Smerz, of Air Comfort Corp., was elected section chairman, and Jack Salmon, Carrier Corp., vice chairman.

DATA SHEET

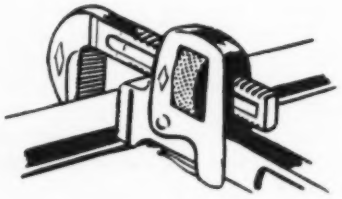
How To Make Pipe Wrenches Last Longer

GOOD WORK demands good tools — and good tools should be used properly and be cared for so they'll stay good. Here are some suggestions for making pipe wrenches last longer.

DO NOT SUBJECT the pipe wrench to side strains. Even the strongest pipe wrench will suffer from this wrong usage

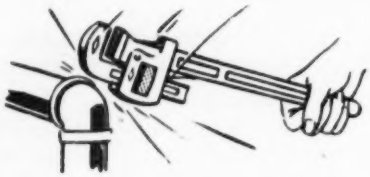


DO NOT APPLY pipe wrenches on hardened steel objects such as set screws, etc. Such practice causes undue wear on the teeth



DO NOT GRIP pipe too near the front or too far back in the jaws of the wrench. Careless application causes slipping and wear

DO NOT PUT extended leverage on the wrench handle. The extra load will strain the wrench excessively. Shorter life results



DO NOT USE a pipe wrench in place of a hammer. It is not designed to withstand the impact and shock. Always use a hammer

KEEP TEETH CLEAN. Give them a chance to grip firmly. Dirty teeth cause slipping. Slipping causes wear — and perhaps accidents

Courtesy Walworth Co.

Heating, Piping & Air Conditioning

THE AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS

JOURNAL SECTION

Heat Flow Analysis in Panel Heating or Cooling Sections

Case II—Floor Slab on Earth with Uniformly Spaced Pipes or Tubes at the Slab-Earth Interface

By H. B. Nottage†, C. V. Franks*, L. E. Hulbert†† and L. F. Schutrum**, Cleveland, Ohio

This paper is the result of research carried on by THE AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS at its Research Laboratory located at 7218 Euclid Avenue, Cleveland 3, Ohio

SUMMARY—The heat flow has been studied for the case of a row of pipes or tubes imbedded in a slab and tangent to one surface, with a solid conducting medium adjacent to this surface, and under conditions such that the opposite slab surface may be taken as isothermal. Results are presented in the form of the thermal resistance between the pipes and the opposite isothermal slab surface. A general mathematical solution was obtained and an electrolytic analogue was employed for establishing application data because of the complexity of the mathematical treatment. A floor slab on the earth is the intended panel-heating application.

A PREVIOUS paper[1] dealt with the case of a uniformly-spaced row of pipes contained in a slab having both surfaces isothermal. This paper presents a second case which is typified by a floor slab on the earth, considered to have an isothermal upper surface and formed by concrete poured over pipes laid on the ground.

These investigations are part of the long-range program in panel heating and cooling at the ASHVE Research Laboratory. The studies have been conducted under advisory guidance of Group A□ of the 1952 Technical Advisory Committee on Panel Heating and Cooling. This group is concerned with problems of heat flow within and behind the heating or cooling section.

The results presented herein have been attained by a combination of mathematical analysis and electrolytic-analogue studies.

Scope

Thermal resistances for heat transfer between the pipe surface and the upper (isothermal) slab surface have been established, for the conditions summarized in Fig. 1, for pipes within the slab and tangent to the slab-earth interface. It must be emphasized that in this analysis *all* heat from the pipe surfaces flows through

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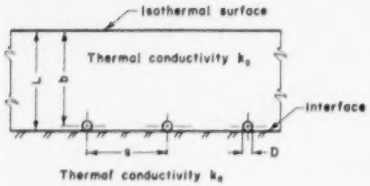
**Research Fellow, ASHVE Research Laboratory. Member of ASHVE.

[1]Exponent numerals refer to References.

□Personnel — *Group A*: R. S. Dill, Chairman; H. L. Flodin, F. E. Giesecke, G. D. Lain, R. L. Maher, V. L. Miller, D. L. Mills, C. W. Nessell, F. E. Parsons, S. I. Rottmayer, R. T. Schoerner, E. E. Scott, S. K. Smith, R. K. Thulman, S. M. Van Kirk, L. H. Yeager.

For presentation at the Semi-Annual Meeting of THE AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS, Denver, Colo., June 29-30, July 1, 1953.



Range of conductivity ratios

$\frac{k_s}{k_e}$ = 0.60 and 1.16, all cases

Range of geometrical proportions

$\frac{s}{L}$ = 0.8 to 2.7 at $\frac{D}{L}$ = 0.0625

$\frac{s}{L}$ = 0.8 to 2.7 at $\frac{D}{L}$ = 0.125

$\frac{s}{L}$ = 1.6 to 4.0 at $\frac{D}{L}$ = 0.250

$\frac{s}{L}$ = 2.7 to 5.0 at $\frac{D}{L}$ = 0.313

Fig. 1—Range of conditions for the thermal-resistance data of this paper for pipes within the slab and tangent to the slab-earth interface

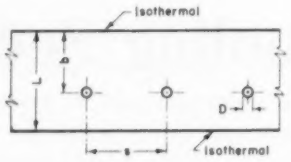
the upper (isothermal) surface, either directly through the slab from pipe to surface, or into the ground and then up between the pipes to the slab surface. This is a consequence of the assumption made in the analysis that the slab is infinite in extent and therefore there can be no *net* heat flow into the earth. This combination of isothermal upper slab surface and *zero heat loss to the earth* is *never* fully realized in practice but is a practical limiting condition in that it represents the best panel performance theoretically possible.

Fig. 2 repeats the range of geometrical proportions covered in the previous reports[1,2] on slabs having both surfaces isothermal. The range of conditions between those described in Figs. 1 and 2 is covered by the general mathematical analysis of the present paper.

For the purpose of checking the electrolytic analogue, limited calculations were made for the pipes located with their centers in the interface as noted in Fig. 3. This condition was selected for calculation because the equation for this case is less involved.

The influence of varying the ratio of the slab thermal conductivity to the earth thermal conductivity, beyond the conditions noted in Fig. 1, was investigated for a single geometrical condition as indicated in Fig. 4.

The mathematical analysis is given in detail in an Appendix to be published in the ASHVE TRANSACTIONS with this paper.* This analysis is fundamentally complete, and includes the following conditions beyond the present case: (1) pipe locations intermediate between those shown in Figs. 1 and 2, and (2) a single source in a slab having surfaces non-isothermal. The case of a row of pipes in a slab with both surfaces non-isothermal may be derived from the latter conditions. Much work is required to express these further general mathematical solutions in simple terms for practical application calculation but this important aspect is beyond the present intent.



$\frac{b}{L}$	$\frac{D}{L}$	$\frac{s}{L}$
0.15	0.10	2.0
0.30	0.30	--
0.50	0.80	6.0

Fig. 2—Range of conditions for the previous case (see Ref. 1) of pipes within a slab having both surfaces isothermal

All results and considerations are restricted to steady-state conditions. Viewing practical applications of the data, the earth and the slab must have uniform thermal conductivities and the regions of *edge effects* are to be excluded from the slab.

Mathematical Analysis

The mathematical derivation is an extension of the previously presented case[1], employing the method of a source and image system. Treatment of a non-isothermal boundary interface involves two considerations: (1) that the temperature of the interface at any point must be the same when approached from either side, and (2) that the rate of heat flow at the interface must be the same when approached from either side. These lead to establishing the ratio of the thermal conductivities of the two adjacent media as an important variable.

The isothermal boundary solution is obtained from this general case by letting the thermal conductivity of the medium adjacent to the slab (in this case, the air) approach an infinite magnitude. The situation of a non-isothermal slab boundary with an adjacent fluid medium (air) can also be handled through the introduction of the thermal conductance between the surface and the fluid body.

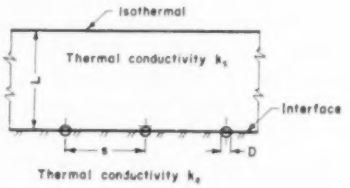
The thermal resistance, R, of interest is that between the pipe surface and the isothermal slab surface; it is defined as

$$R = \frac{\text{(Temperature difference between pipe surface and isothermal slab surface)}}{\text{(Mean rate of heat flow per unit area of the isothermal slab surface)}}$$

The system envisioned is diagrammed in Fig. 1.

Analogue Investigations

The final mathematical equation‡ for the thermal resistance, R, is very difficult to evaluate without the aid of special computing devices. In order to focus upon practical ap-



For $\frac{k_s}{k_e}$ = ∞

$\frac{s}{L}$ = 0.5 to 4.0 at $\frac{D}{L}$ = 0.0625

For $\frac{k_s}{k_e}$ = 1

$\frac{s}{L}$ = 0.5 to 4.0 at $\frac{D}{L}$ = 0.0625

Fig. 3—Conditions evaluated for the pipes being located with their centers in the slab-earth interface

*Pending TRANSACTIONS publication, mimeographed copies of this Appendix may be obtained by applying to the ASHVE Research Laboratory.

‡This equation, because of its complexity, is not included here but is given in full in the Appendix.

plication results, two compromises were made: (1) that only a limited range of geometrical proportions and thermal conductivities would be considered, these being representative of panel heating floor slabs on the earth, and (2) that a certain inaccuracy would be tolerated in the results, since the practical application did not warrant high precision.

The following steps were then taken:

1. The equation for the thermal resistance was evaluated for the range noted in Fig. 3, with the result shown in Fig. 5.

2. The electrolytic analogue, as employed previously[3], was set up to solve the same problem. The comparison between the mathematical results and the analogue data is given in Fig. 5. This serves as an indication of the analogue accuracy to be expected. In using the analogue, different thermal conductivities were simulated through different depths of electrolyte on the opposite sides of the interface.

3. Judging the analogue to be acceptable, measurements of thermal resistance were made over the range in Fig. 1. The results are shown in Fig. 6, wherein the $R/(L/k_e)$ ordinate is the ratio of the measured resistance to the resistance of a simple slab having isothermal surfaces and with the same thickness and thermal conductivity as the slab concerned.

4. A supplementary test was made on the effect of variations of thermal conductivity, as noted in Fig. 4 and shown in Fig. 7.

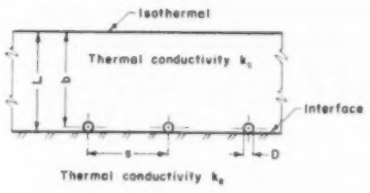


Fig. 4—Conditions covered in exploring the influence of earth and slab thermal conductivities

Discussion

Table 1, column 4, gives the slab resistance for some practical values of tube size, tube spacing, and slab thickness which are covered by the general dimensionless ratios of Fig. 6. The effect of varying the slab thickness, tube size, and tube spacing

Table 1—Tube Temperatures for 85 F Slab Surface Temperature and 40 Btu per (hr) (sq ft) Slab Heat Output

Slab Thickness L, In.	Tube Size D, In. O.D.	Tube Spacing S, In.	Slab Resistance[a] (Hr) (Sq Ft) F deg/Btu	Tube to Surface Temp Diff F Deg	Tube Temp F
4	5/8	4	0.363	14.5	99.5
4	5/8	8	0.492	19.7	104.7
4	5/8	12	0.630[b]	25.2	110.2
6	5/8	4	0.515	20.6	105.6
6	5/8	8	0.645	25.8	110.8
6[c]	5/8	12	0.790	31.6	116.6
6	5/8	16	0.960[b]	38.4	123.4
6	1-3/8	4	0.452	18.1	103.1
6	1-3/8	8	0.582	23.3	108.3
6	1-3/8	12	0.650	26.0	111.0
6	1-3/8	16	0.772	30.9	115.9

[a]Slab resistances (tube to isothermal surface) for k_e = 12.0 and k_c = 10.55 Btu/(hr) (sq ft) (F deg per in.)

[b]Estimated by extrapolation of curves in Fig. 6.

[c]Conditions for illustrative problem.

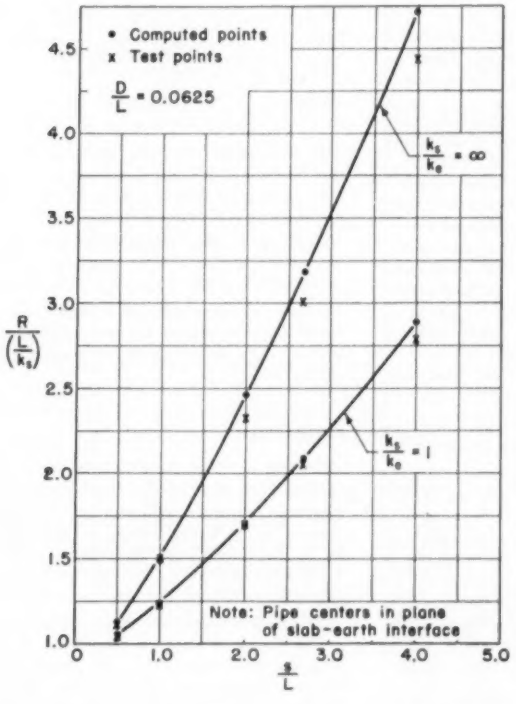


Fig. 5—Comparison of computed results and analogue data for the system of Fig. 3

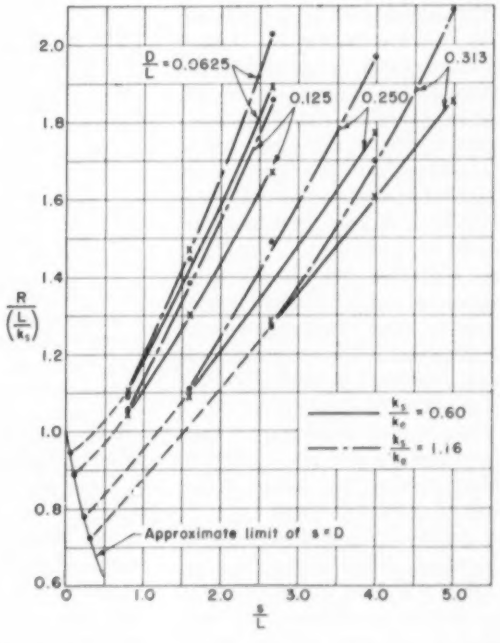


Fig. 6—Thermal resistance magnitudes for the practical range of slab geometries given in Fig. 1

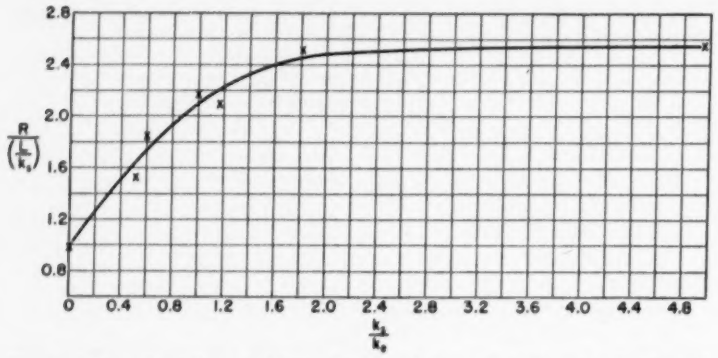


Fig. 7—Illustrative effect of slab-earth conductivity ratio k_s/k_e upon the thermal resistance for the system of Fig. 4

upon the slab resistance is shown for any heat flow rate or slab surface temperature. The tube temperatures shown in Table 1 are the minimum temperatures which would produce an 85 F isothermal upper surface temperature and a surface heat flow rate of 40 Btu per (hr) (sq ft) with the specified slab and earth conductivities. *In practice, tube temperatures will always be higher than those illustrated* and will be highest for wider tube spacings which produce the greatest departure from isothermal surface conditions.

The effect of earth conductivity upon the values given in Table 1 can best be shown from Fig. 7. For a decrease in earth conductivity, k_e, the ratio k_s/k_e becomes larger, resulting in a higher slab resistance. In practice, the higher slab resistance resulting from the lower earth conductivity would be somewhat compensated by a reduced heat loss into the earth.

The resistance magnitudes presented cover only a limited range pertinent to most common usage in panel heating. The mathematical analysis, however, is perfectly general and may be applied to other than panel heating problems. A heat pump source located at a distinct boundary between two media is one example of a related system.

The steady-state limitation must be kept in mind. While it may be common practice to base design estimates on steady-state conditions, it is very doubtful if such ever prevail, strictly speaking, in actual panel-heating operation.

The thermal resistance reported in this paper is but one element of a complete thermal circuit. For a floor slab, one branch of this circuit would go into the earth, and the other branch would run out through the heated structure. Studies of this circuit are an important problem deserving attention.

Cases of non-uniform pipe spacing may be dealt with by an extension of the theory or by using the analogue. Consideration of the thermal conditions near the edge of a finite slab also is possible by the theory but would involve very complicated detail; the analogue is available as a more simple approach.

Nomenclature

- b = distance between pipe axis and isothermal slab surface, inches or feet.
- D = pipe outer diameter, inches or feet.
- k_s = thermal conductivity of slab material, Btu per (hour) (square foot) (Fahrenheit degree per inch).
- k_e = thermal conductivity of the adjacent medium (*e.g.*, the earth) Btu per (hour) (square foot) (Fahrenheit degree per inch).
- L = slab thickness, inches or feet.
- R = thermal resistance between pipe surface and opposite isothermal slab surface, defined in the text, (hour) (square foot) (Fahrenheit degree) per Btu.
- s = pipe center-to-center spacing, inches or feet.

The results in Fig. 6 have not been checked by mathematical computations. Rough judgment of the accuracy is available from Fig. 5.

Conclusions

1. The practical case of a floor slab on the earth, for the limiting conditions of zero heat loss to the earth and isothermal upper slab surface, has been solved in complete mathematical form, demonstrating the utility of the method of mathematical analysis invoked.

2. The final equation from the theory was found to be too complicated for general numerical work; analogue data were therefore obtained over the limited range of panel heating interest.

Illustrative Problem

A. Determine the thermal resistance for the following concrete slab:

Slab
Thickness $L = 6$ in.
Tube Spacing $s = 12$ in.
Tube Size $D = \frac{5}{8}$ in. ($\frac{1}{2}$ in. nominal)
Slab
Conductivity $k_s = 12$ Btu per (hr) (sq ft) (F deg per in.)
Earth
Conductivity $k_e = 10.35$ Btu per (hr) (sq ft) (F deg per in.)

Using the given values,
$s/L = 2$, $D/L = 0.104$, $k_s/k_e = 1.16$
From Fig. 6 $R/L/k_s = 1.58$ by interpolation between $D/L = 0.0625$ and $D/L = 0.125$
Substituting for L and k_s, $R = 0.79$ (hr) (sq ft) (F deg) per Btu

B. Determine the tube temperature in the foregoing problem for a surface heat flow rate of 40 Btu per (hr) (sq ft) and a surface temperature of 85 F.

Tube to surface temperature difference = 40 x *resistance* from tube to surface = 40 x 0.79 = 31.6 F deg.

The tube temperature, therefore, is 116.6 F which is the sum of the surface temperature and the tube to surface temperature differential.

References

1. ASHVE Research Report No. 1388—Heat Flow Analysis in Panel Heating or Cooling Sections, Case I—Uniformly Spaced Pipes Buried within a Solid Slab, by L. E. Hulbert, H. B. Nottage, and C. V. Franks (ASHVE Transactions, Vol. 56, 1950, p. 189).

2. ASHVE Research Report No. 1387—Laboratory Studies on Heat Flow Within a Concrete Panel, by C. M. Humphreys, H. B. Nottage, C. V. Franks, R. G. Huebscher, L. F. Schutrum and D. W. Locklin (ASHVE Transactions, Vol. 56, 1950, p. 175).

Friction Losses in Round Aluminum Ducts

By F. W. Hutchinson*, Berkeley, Calif.

SUMMARY — This paper presents results of experimental work leading to evaluation of the roughness factor and subsequently the friction factor of round aluminum duct. The results indicate that aluminum duct of standard construction presents less frictional resistance than does conventional sheet metal ducting. The advantage of aluminum increases with velocity and at high velocities the size of an aluminum duct, for fixed volume of air handled, would be substantially (of the order of 10 percent) less than the required size of a galvanized iron duct.

The paper also presents limited test results on galvanized iron duct; these results confirm the accuracy of the HEATING, VENTILATING, AIR CONDITIONING GUIDE 1952 friction charts for use in the design of galvanized iron ducts. A procedure is established to permit applying a correction factor to the Guide charts to enable using them in the design of aluminum ducts.

BECAUSE OF THE uncertainties in the then existent duct friction charts, the ASHVE Technical Advisory Committee on Air Distribution and Air Friction initiated studies in 1945 leading to development of the two friction charts that now appear in the HEATING, VENTILATING, AIR CONDITIONING GUIDE.[1] These two charts were developed by Wright[2] after reviewing the literature and selecting — from test work by others — that roughness value, 0.0005 ft, which seemed most applicable to round, galvanized, sheet metal duct with approximately 40 joints per 100 ft. For duct materials having greater or less roughness than galvanized iron Wright stated that *The best solution to the problem would be to have several different charts for the materials most frequently used.* Wright also expressed uncertainty with respect to the selected value of the roughness, noting that *The uncertainty lies in whether the absolute roughness, e, of the duct surface is constant for all sizes or increases with diameter.*

In a subsequent research paper[3] Madison and Elliot presented a graphical means of applying a rational correction factor to the GUIDE charts when used with materials having a known surface roughness differing from the value selected by Wright. The Madison and Elliot contribution offered a convenient and effective method of expanding the usefulness of the basically sound Wright charts. The Madison and Elliot correction was adopted for use in THE GUIDE[4]. On this correction chart the curves for medium smooth are based on an absolute roughness of 0.00015 whereas those for very smooth are based on an absolute roughness of 0.0000015.

In practice the use of the Madison and Elliot chart as a means of correcting friction losses in THE GUIDE is sometimes difficult, since the absolute roughness of the proposed duct material may not be known and an accurate comparative estimate of roughness may be very difficult. The present research paper is the first of a probable series intended to provide accurate experimental data on some of the materials more commonly used in duct construction. This first paper reports limited experimental work which confirmed Wright's estimate of the roughness of galvanized iron and presents more comprehensive experimental results leading to the establishment of precise correction factors for use with the GUIDE friction charts[1] when using aluminum as a duct material.

Experimental Procedure

For straight round duct of uniform cross-section the problem of experimentally determining friction losses is one requiring accurate evaluation of two characteristics: (1) The average velocity (or the volume of flow) for use in the equation $Q = VA$ where Q is the flow rate in cubic feet per minute, V is the average velocity in feet per minute and A is the cross-section area of the duct in square feet, and (2) the drop in static pressure (since for uniform cross-section the velocity pressure does not change) between points on the duct that are a known distance apart.

Fig. 1 shows a general view of the experimental set-up used in the work reported here. As a first approximation, and to assist in adjusting the variable speed of the blower, the velocity at the center of the duct was determined by means of a thermo-anemometer (shown in Fig. 1 at the discharge end of the 12 in. aluminum duct). A re-check on maximum and average discharge velocity was also obtained by using a Velometer with fittings permitting velocity evaluation a few inches in from the end cross-section of the duct.

The primary means of velocity determination was by a pitot tube traverse (both vertically and horizontally) to obtain an accurate representation of the velocity pattern across a particular cross-section. The pitot tube is shown in Fig. 1 inserted in the test section approximately 10 ft upstream from discharge. Total pressure and static pressure connec-

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[1]Exponent numerals refer to References.

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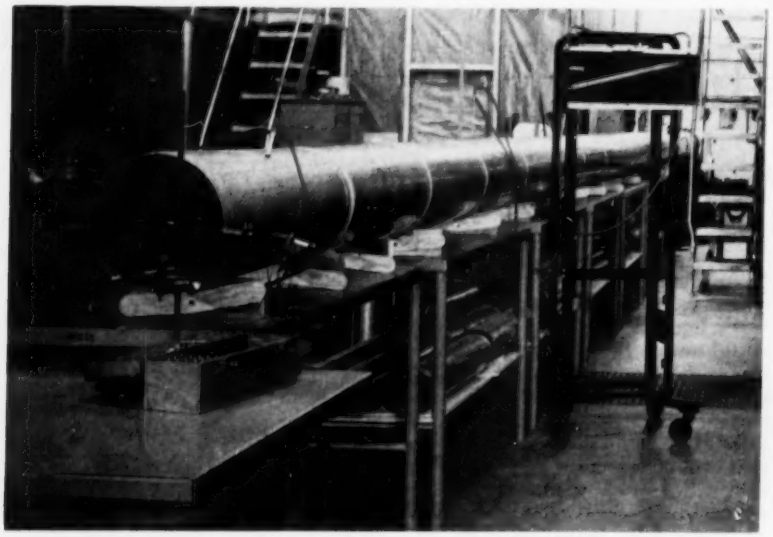


Fig. 1—General view of the experimental set-up with 12-in. aluminum ducts

Fig. 2—Fan with variable speed drive for supplying air for tests

tions are shown going to an inclined differential pressure manometer which read velocity pressure. The manometer was graduated to hundredths of an inch and could be read with an accuracy of approximately 0.003 in. of water. Based on the pitot traverses the average velocity could be evaluated from the equation,

$$VA = V'dr^2 \quad \ldots\ldots\ldots\ldots\ldots\ldots \quad (1)$$

where

V = average velocity expressed in feet per minute.
A = cross-section area in square feet.
r_o = radius of the duct, in feet.
dr = differential radius
V' = point velocity, at a given pitot position, obtained from the Equation 2.

$$V' = 4005\ (p_v)^{\frac{1}{2}} \quad \ldots\ldots\ldots\ldots\ldots\ldots (2)$$

where

V' = point velocity, feet per minute.
p_v = pitot-measured velocity pressure, inches of water. All readings were corrected to standard air.

Static pressure taps were circumferentially located at a cross-section 18 in. upstream from discharge and at another cross-section approximately 38 ft upstream of the first (the exact distance between taps varied slightly with different sizes of duct). Both sets of taps are shown in Fig. 1, the two being connected (not shown) by tubing to a differential inclined manometer which read loss of static pressure between the test cross-sections. This manometer also could be read with an accuracy of approximately 0.003 in. of water. At various times during the test period the relative position of the static pressure taps with respect to entrance and discharge was altered and the resultant pressure loss per 100 ft of duct compared with the value obtained when the taps were in the original position. This was done in order to assure the absence of error due to possible entrance or discharge effects. At no time, during these comparative tests, was any difference in static loss (per 100 ft) observed which was great enough to be attributable to other than the limit of experimental accuracy.

As shown in Fig. 1 the 12-in. test duct is in place. Beneath the tables in the same figure can be seen the 6-in. galvanized, 6-in. aluminum, and 3-in. aluminum ducts which were installed for later tests.

Fig. 2 shows the fan with variable-speed drive which was used for tests at low-to-moderate velocity. For the high velocity tests the fan shown was replaced with a high-speed blower direct-connected to a motor and operating therefore at fixed speed. Shown in Fig. 2 is a typical transition piece connecting the fan discharge to a 6-ft section of duct, of test diameter, in which *egg crate* straightening lattices were installed. On tests with 3-in., 6-in., and 12-in. duct the straightening section was, in each case, 6 ft long and contained two separated 2½-ft lattice straighteners.

Following the standard practice with aluminum duct work the sections were 3 ft in length, thus giving approximately 33 joints per 100 ft of length. Joints (see Fig. 1) were of standard slip type with the crimped end of one section being slipped into the uncrimped end of the adjacent downstream section; all joints were then externally taped as shown in Fig. 1.

Analysis of Experimental Results

Since the Guide friction loss charts are based on variable friction factors as determined from the Moody[5] chart, Fig. 3, the procedure in the present work was to use the experimentally determined static pressure loss and velocity (for a given size duct) to obtain from the Moody chart the corresponding value of the relative roughness, e/D; the absolute roughness, e, could then be readily calculated in terms of known diameter. Table 1 presents a summary of re-

sults and refers to Appendix A for typical sample calculations showing the method followed in evaluation of e/D and of the absolute roughness e.

The significance of results shown in Table 1 becomes more readily apparent when the e/D values from the Table are shown graphically — with respect to typical materials — on the Moody[5] representation of Fig. 4. The three points marked with x each indicate one experimental determination of e/D for 6-in. galvanized duct. One point (from test 9 at 1310 fpm velocity) exactly agrees with Wright's[2] assumption of 0.0005 as the roughness for galvanized iron whereas the other two points bracket the first, but do not indicate appreciable departure. Based on this limited experimental work it is suggested that Wright's selection of 0.0005 for galvanized iron duct is in accord with the roughness of such ducts of average construction; in effect, this limited work confirms the accuracy of the ASHVE friction chart when used — as was intended — with galvanized iron.

Table 1—Experimental Results

Type of Duct	Test No.	Duct Diameter Inches	Velocity[a] Fpm	Head Loss[b] In. Water	e/D[c]	e[d]
Aluminum	1	3	1505 fpm	1.34	0.0006	0.00015
	2	3	4710	11.00	0.0005	0.00012
	3	6	1525	0.495	0.0005	0.00015
	4	6	2002	0.99	0.0004	0.0002
	5	6	5940	7.07	0.0002	0.0001
	6	12	1975	0.40	0.0001	0.0001
	7	12	2310	0.535	0.000186	0.000186
	8	12	2740	0.78	0.0002	0.0002
Galvanized Iron	9	6	1310	0.493	0.001	0.0005
	10	6	1932	1.014	0.0009	0.00045
	11	6	5850	9.24	0.0013	0.00065

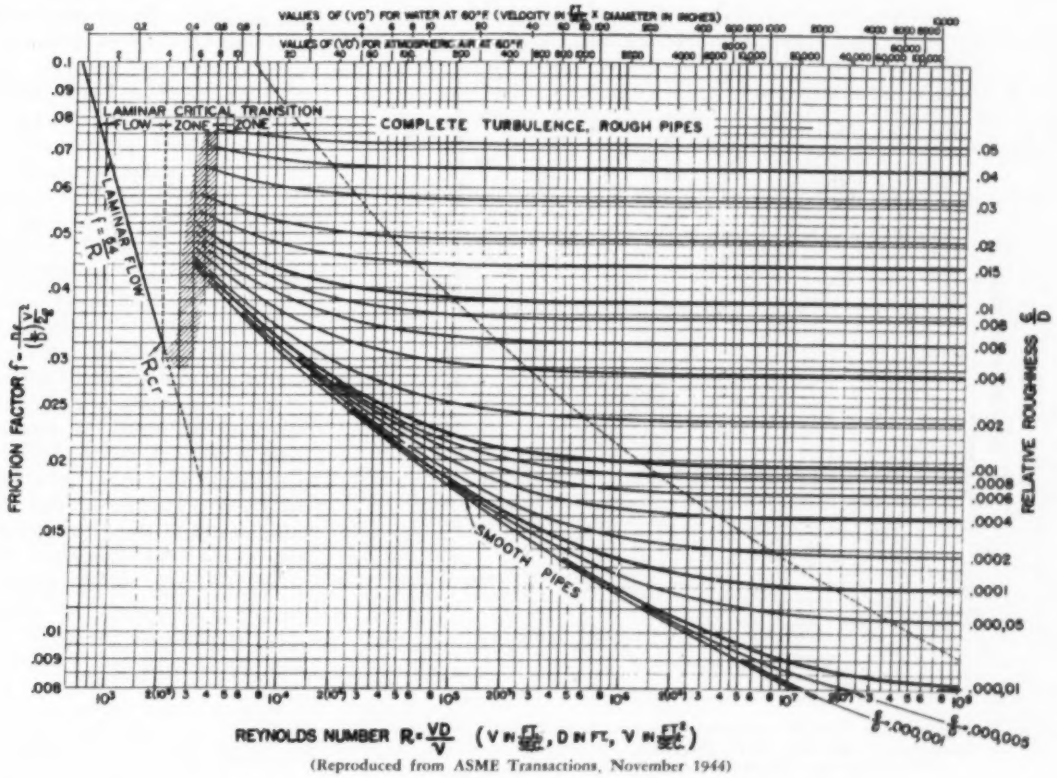
[a]The recorded velocity for each test is the average value as determined by a pitot tube traverse of the duct.

[b]The head loss is expressed in inches of water per 100 ft length of straight duct; actual test sections average 37 ft between static pressure taps.

[c]Sample calculation (for test 9) given in Appendix A.

[d]Sample calculation (for test 9) given in Appendix A.

The experimental points on Fig. 4 for the tests on aluminum duct indicate a substantially smaller value of the absolute roughness. For 3-in. duct one point exactly corresponds to the value of e/D for commercial steel or wrought iron pipe (with an absolute roughness of 0.00015) and the second point — at much higher velocity — indicates a slightly lower (0.00012) value. For 6-in. duct one point again exactly corresponds to the e/D for commercial steel and wrought iron pipe whereas the other two points bracket the first. For 12-


VALUES OF (VD') FOR WATER AT 60°F (VELOCITY IN FT/SEC X DIAMETER IN INCHES)
VALUES OF (VD') FOR ATMOSPHERIC AIR AT 60°F
LAMINAR CRITICAL TRANSITION
FLOW ZONE ZONE
COMPLETE TURBULENCE, ROUGH PIPES
LAMINAR FLOW
SMOOTH PIPES
FRICTION FACTOR
RELATIVE ROUGHNESS e/D
REYNOLDS NUMBER R = VD/ν (V IN FT/SEC, D IN FT, ν IN FT²/SEC)

(Reproduced from ASME Transactions, November 1944)

Fig. 3—Relation between friction factor and Reynolds' number

in. duct the three experimental points bracket the e/D for commercial steel pipe, but do not differ greatly from it.

Discussion of Results

From Table 1 and the plotting of points on Fig. 4 it seems evident that the absolute roughness of aluminum duct is of the order of 1/3 that of galvanized iron (absolute roughness of approximately 0.00015 as compared with 0.0005). Thus in designing aluminum ductwork proper correction factors should be applied to friction losses as determined from the charts in THE GUIDE.

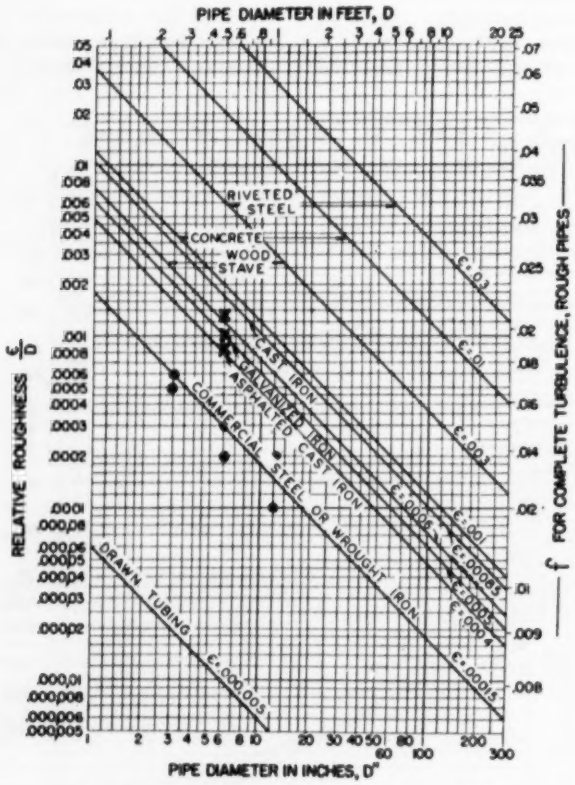
As a first approximation the Guide correction curve[4] for medium smooth material could be used. Slightly more conservatively, however, and to permit greater accuracy over a wider range of diameters specific recommended correction factors have been computed for aluminum duct (based on the experimental results here reported) and are presented graphically (in form identical with that used in the Guide's method of Madison and Elliot[4]).

In developing the correction factors it was noted (Table 1) that for duct sizes of 3-in. and 6-in. a design value of absolute roughness for aluminum of 0.00015 would appear acceptable. For duct sizes greater than 12-in. there seems to be a possibility that the absolute roughness exceeds 0.00015, but it is thought conservative to use 0.0002 as a design value. As noted by Wright[2] inadequate data are available to permit determination

Fig. 5—End view of duct showing marked discontinuities at joints (prepared and assembled under ordinary shop conditions)

concerning the possible increase of the absolute roughness with diameter, but certain theoretical considerations suggest that a slight increase might be expected. Thus with round duct and slip joints the *roughness* responsible for loss of head is of two kinds: (1) Roughness of the material of which the duct is constructed, and (2) roughness due to discontinuities of the internal surface at each joint. Fig. 5 shows clearly the marked discontinuities that occur at joints of duct prepared and assembled under ordinary shop conditions†.

The foregoing two types of roughness superimpose and combine to establish the experimentally determined *absolute roughness*. The roughness of the material would be expected to remain constant, but the joint roughness might well vary as a function of diameter due to the fact that — for fixed 3 ft length of sections — the number of diameters between joints decreases rapidly as the duct diameter increases. In connection with another type of problem this concept of composite roughness has



(Reproduced from ASME Transactions, November 1944)

Fig. 4—The Moody representation comparing relative roughness (e/D) for several materials
●=Values for aluminum determined by experiments.
x=Values for galvanized iron determined by experiments

†In order to insure that the duct tested on the present research project would conform to average practice the duct sections were fabricated by a commercial sheet metal establishment and the method of assembling and taping sections corresponded to actual practice. Thus irregularities and discontinuities at the joints were substantially greater than would normally have occurred in laboratory work.

been investigated by Einstein and Banks[6]. Thus to assure conservative results the correction factors for duct diameters greater than 10-in. have been based on an absolute roughness of 0.0002 as against the value of 0.00015 for ducts 10-in. in diameter or smaller.

Fig. 6 presents in graphical form the recommended correction factors, for aluminum ductwork, to be used with the Guide friction charts[1]. The calculations, on which Fig. 6 is based, were made from experimental results tabulated in Table 1; a typical sample calculation of a correction factor is given in detail in Appendix B.

Of particular interest is the fact that friction losses in aluminum duct work are from 15 to 25 percent less than in galvanized ducts for applications where the diameter is small and the velocity is high. Since there seems to be growing adoption of high velocity design it seems particularly important that accurate correction factors be made available in these regions where uncorrected use of the Guide friction charts would lead to overly conservative results.

Conclusions

The ASHVE duct friction charts[1] were designed for galvanized iron and based on a value of the absolute roughness of 0.0005 ft. For use with ducts made of materials other than galvanized iron the Guide charts require correction and this is usually accomplished by application of factors taken from the Guide correction curves[4]. Unfortunately accurate experimental data have not been available on the absolute roughness of materials used in duct work other than galvanized iron; hence the practical designer has had difficulty in selecting the proper correction coefficient. The present research report provides limited experimental data which further corroborate the accuracy of the Guide friction charts. It also presents detailed experimental data leading to the development of recommended correction coefficients (Fig. 6) for use with the Guide charts when using aluminum as the duct material.

The test results indicate that the existing Guide correction factors[4] for a *medium smooth* material may be used for aluminum with reasonable accuracy, but the values given in Fig. 6 — though slightly more conservative at larger diameters — are more accurate because they include a larger range of diameters, hence requiring less interpolation.

APPENDIX A
Evaluation of Roughness

The HEATING, VENTILATING & AIR CONDITIONING GUIDE 1952 (p. 672) states that the pressure loss in circular ducts is given by the equation:

$$h_f = f\,(l/D)\,(v^2/2g) \quad \ldots\ldots\ldots \text{(A-1)}$$

where

h_f = head loss due to friction, in feet of the fluid flowing.
l = length of conduit, feet.
D = inside diameter of conduit, feet.
v = mean fluid velocity, feet per second.
g = acceleration due to gravity, 32.17 feet per (second) (second).
f = a non-dimensional friction coefficient, which for ventilation work depends on the Reynolds Number and the relative roughness of the conduit.

Taking the specific weight of water as 62.3 lb per cu ft and the density of air as 0.075 lb per cu ft a relationship can be established between the head loss in feet of air flowing and the equivalent head loss, H, expressed in inches of water:

$$H = (0.075 \times 12)/(62.3)\ h_f$$

or,

$$h_f = (62.3 \times H)/(0.075 \times 12) = f(l/D)\ (v^2/2g)$$

For a duct length of 100 ft, with the velocity expressed in the more convenient units of feet per minute, V,

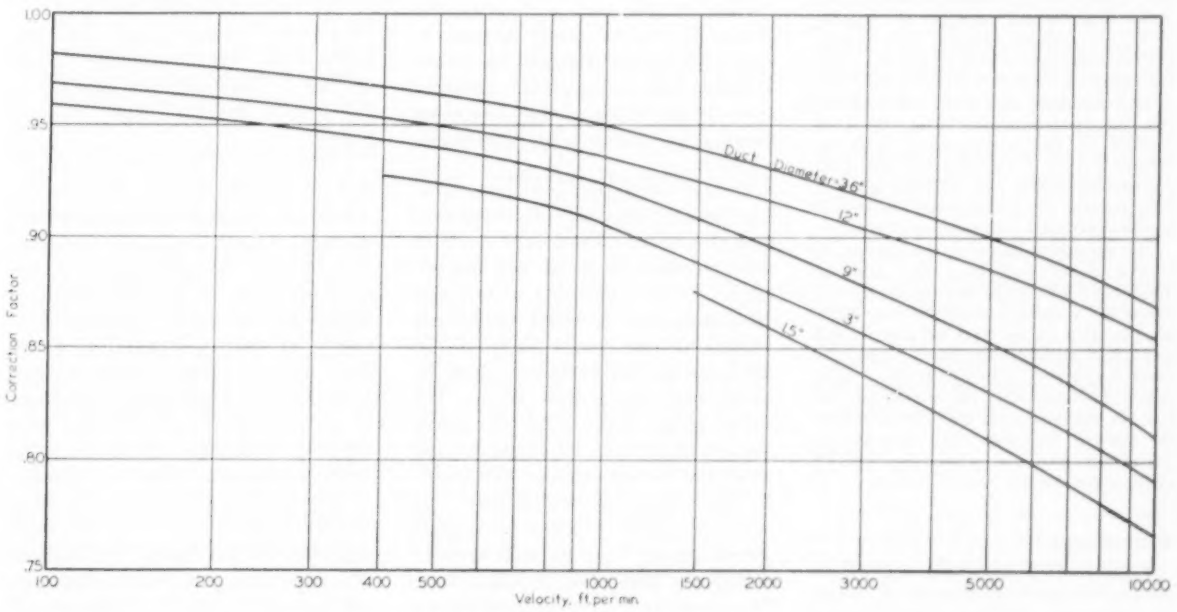


Fig. 6—Correction factors for aluminum duct

and the diameter in the more convenient units of inches, D inches, Equation A-1 permits evaluation of the friction factor, f, as

$$f = (62.3 \times 64.4 \times H \times D'' \times 3600) \div (0.075 \times 12 \times 100 \times 12 \times V^2) = 13{,}370(HD''/V^2) \quad \ldots\ldots\ldots \text{(A-2)}$$

where

f = friction factor
H = head loss per 100 feet expressed in inches of water
D'' = duct diameter in inches
V = velocity in feet per minute

Sample Calculation: From Table 1, test 9 on 6 in. galvanized pipe at 1310 fpm gave a static pressure loss of 0.493 in. per 100 ft of duct. The friction factor is then,

$f = 13{,}370(0.493 \times 6/1310^2) = 0.0230$ and the VD'' product is $(1310/60)(6) = 131$

Then from Fig. 3 with $f = 0.023$ and $VD'' = 131$ the value of e/D is read as 0.001 and the absolute roughness, e, is then $(6/12)(0.001) = 0.0005$. This value is in agreement with the assumed absolute roughness selected by Wright[3] and used in constructing the Guide friction charts for flow through galvanized iron ducts.

APPENDIX B
Evaluation of Correction Factor

In THE GUIDE the roughness used in construction is 0.0005. Thus for a 3-in. diameter duct the value of $e/D = 0.005/0.25 = 0.0020$. At a selected velocity of 10,000 fpm the VD'' product is $(10{,}000/60)(3) = 500$, so entering Fig. 3 at a VD'' of 500 and an e/D of 0.0020 one reads the corresponding friction factor as 0.024.

With aluminum duct work at 3-in. diameter the roughness should be taken as 0.00015 so the corresponding $e/D = 0.00015/(3/12) = 0.00060$ and the VD'' product, at 10,000 fpm velocity, remains 500; therefore, from Fig. 3 the corresponding friction factor is read as 0.0190.

The correction factor to be applied to friction losses read from the chart in THE GUIDE is then the ratio of the friction factor for aluminum to the friction factor used in THE GUIDE: thus for 3 in. aluminum duct with 10,000 fpm velocity, the correction factor is $0.0190/0.024 = 0.792$ which indicates that the actual friction loss for the aluminum duct is more than 20 percent less than that through the galvanized duct for which the ASHVE chart is constructed.

References

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3. Friction Factors for Gases Including Correction for Temperature, Viscosity and Pipe Roughness, by R. D. Madison and W. R. Elliot (ASHVE JOURNAL SECTION, *Heating, Piping & Air Conditioning*, October 1946).

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6. Fluid Resistance of Composite Roughness, by H. A. Einstein and R. B. Banks (*Transactions* of the *American Geophysical Union*, Vol. 31, August 1950, p. 603).

RADIANT GLASS HEATING PANELS

The *National Bureau of Standards* has recently made a study of Radiant Glass Heating Panels as used in residences and other small buildings. Based on the results of the tests, electric heating can be expected to entail higher annual heating costs in most areas than would coal, oil or gas, because useful heat delivered from electricity has a higher unit cost than that produced from these common fuels.

The tests were conducted in the *NBS* test bungalow, a one-story, basementless house of four rooms and bath. The typical glass panel is mounted on a metal frame and backed by a reflective shield from which it is separated by a small air space. The conductor and heating element is provided by a metallic coating on the rear surface of the glass. A typical panel output is about 1000 watts designed for either 115 or 230 volts, and is usually mounted beneath a window as a baseboard unit or vertically adjacent to windows.

Heat is transmitted from glass heating panels, primarily by radiation and convection. Tests were run with the bungalow insulated and uninsulated. In the beginning of the tests 10 panels were installed in the test bungalow, one under each of the windows of the bungalow, and located just above floor level. The initial power demand for the panels was about 145 percent of the demand after the panels became thoroughly heated. Approximately 20 min were required after starting to attain steady power demand, and approximately 30 min were required to attain a steady temperature on the exposed glass surface.

The temperature gradient in the living zone (2 to 60 in. above the floor) ranged from 3.5 deg for an outdoor temperature of 32 F to 7.0 deg for an outdoor temperature of 0 F. The vertical temperature differences in the living zone with the radiant glass panels were 1 to 2 F greater than those observed in the same house with a baseboard convector heating system. Although insulation did not significantly change the vertical temperature difference, the time during which the heaters were energized was appreciably less in the insulated house.

From the data accumulated on the effect of lowering and raising the thermostat, it appears that in the insulated house utilizing 10 panels, one hour is required to raise the room temperatures for 65 to 70 F at an outside temperature of 0 F. Analysis of the tests indicated that compensated room thermostats with very low differentials which produce rapid cycling of the heat units are desirable with radiant glass heating panels.

The results of these tests indicate that electrically heated glass panels constitute a satisfactory method of warming a well insulated, basementless house. Accepted methods for the calculation of the heat loss of a house may be used in the determination of the total capacity of the heat units required. Total energy required for a particular condition of warmth may be slightly less with electric panels than with conventional heating units because of the absence of piping or duct heat loss, because the reverse heat losses from the heating elements are lower, and because the individual room thermostats can more readily prevent over-heating of rooms.

A Comparison of Physiological Adjustments of Clothed Women and Men to Sudden Changes in Environment

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This paper is the result of research sponsored by THE AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS and by the United States Public Health Service in cooperation with the University of Illinois, College of Medicine, Chicago, Ill.

SUMMARY—The object of these tests was to determine whether women could make the necessary physiological adjustments as readily as men when changing suddenly from a comfortable to a hot moist environment and on returning to the comfortable environment. Comparisons made with previous tests on men indicate that women adjust as readily as men. In changing to a hot environment, women experience faster skin temperature rise than men and a slower appearance of sweat.

AN EARLIER PAPER[1] recorded the physiological changes in young men clothed in union suits or in summer clothing on entering a hot moist room from a comfortable room and on returning to the comfortable room. These healthy subjects adjusted with ease to each new condition. We are now amplifying that report with the data on healthy young women, Table 1, observed under similar conditions so that the two sexes may be compared. The experiment imposes stress on the processes concerned in the adjustment of the subject to heat exposure much as does leaving an air-conditioned space for the outside on a hot humid day and returning to the cooled space with clothing saturated with sweat.

Experimental Routine

Young healthy women, having measurements shown in Table 1, were observed for 1 hr in a comfortable room maintained at 76 F with either 30 or 80 percent relative humidity (RH), corresponding to 68.8 and 73.4 effective temperature (ET), respectively. Seven women were dressed in union suits rigged with multiple thermocouples[2] and eight in summer clothing. The union suit was of a 12 lb/doz, knitted, 90 percent cotton — 10 percent wool fabric, whereas the summer clothing consisted of a short length cotton knitted underwear fitted with thermocouples[1], nylon slip and hose, and a dress of cotton broadcloth. The total weight of this assembly was about 20 oz.

Table 1—Physical Measurements of Subjects

Subject	Group*	Age Years	Weight Pounds	Height Inches	Body Area Sq Ft
E.F.	US	24	129	67	18.2
M.L.	US	22	122	68	17.9
D.M.	US	23	169	71	21.1
J.M.	US	23	120	64	17.0
T.M.	US	22	117	64	16.8
M.O.	US	26	120	67	17.0
P.K.	US, SCI	24	115	60	15.9
C.B.	SCI	20	125	60	16.6
L.B.	SCI	20	114	62	16.3
A.K.	SCI	21	146	67-½	19.2
J.L.	SCI	22	101	61-½	15.3
V.P.	SCI	24	124	66	17.5
G.T.	SCI	21	140	70	19.4
Z.O.	SCI	26	130	65	18.0
Average	US	23.4	127	65.9	17.7
	SCI	22.3	124	64.0	17.3

*US indicates subjects participated in experiments wearing union suits.
SCI indicates subjects participated in experiments wearing summer clothing.

Observations of body weight were made with the subject seated on a balance. Skin and rectal temperatures, pulse, blood pressure, and the subjective feeling of warmth or coolness (thermal sensations) were recorded as earlier described[2]. The weight loss, determined from changes in body weight, was used to calculate evaporative heat loss assuming minimal errors in weight as the result of respiratory gaseous exchange.

After 1 hr in the comfortable room the subjects walked into an adjoining hot room, maintained at 98.5 F with a 66 percent RH equivalent to 90.2 ET, and remained there, seated on another balance, for 1 or 2 hr. At the end of the hot room exposure they returned to the comfortable room and were observed for an additional hour.

Results

Comfortable Room

One hour stay in the comfortable room permitted the subjects to stabilize with respect to rectal and skin temperatures, pulse rate, blood pressure, thermal sensation, and evaporative weight loss. The values for

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***Member of ASHVE.
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[1]Exponent numerals refer to References.

Table 2—Observations on Physiological Adjustments of Women Dressed in Either Union Suit or Summer Clothing to Sudden Change from a Comfortable Environment of Either 30 or 80 percent RH to a Hot Humid Environment

Observation	Physiological Adjustments to Heat Exposure			
Type of Clothing	Union Suit		Summer Clothing	
Relative Humidity of Previous Exposure	30	80	30	80
Mean Skin Temperature (F)				
Level before heat exposure	91.55	91.51	92.83[a]	92.53[a]
Level after 10 min heat exposure	96.87	95.96[b]	97.26	96.10[b]
Increase in 10 min	5.32	4.45[b]	4.43[a]	3.57[a,b]
Level at 1 hr	97.30	97.03	97.33	97.12
Level at 2 hrs	97.82	97.52	97.51	97.44
Rectal Temperature (F)				
Level before heat exposure	98.51	98.31	98.20	98.10
Minimum level in 10 min	98.39	98.19	98.03	97.93
Decrease in 10 min	0.13	0.12	0.17	0.17
Level at 1 hr	98.77	98.61	98.61	98.49
Level at 2 hrs	99.40	99.06	99.20	99.00
Thermal Sensations				
Before heat exposure	4.0	4.0	4.1	4.2
On entrance to hot room	6.1	6.3	6.6	6.6
After 1 hr	6.6	6.9	6.3	6.1[a]
After 2 hrs	6.6	6.9	6.2	6.2[a]
Water Losses				
Rate of water loss before heat exposure (Btu per (hr) (sq ft))	5.42	4.93	6.05	5.72
Time of visible sweat (min.)	19.6	15.6	14.4	15.8
First hour rate of evaporation in hot room (Btu per (hr) (sq ft))	4.90	6.17	5.46	7.07
Second hour rate of evaporation in hot room (Btu per (hr) (sq ft))	11.85	10.20	13.90	13.94[a]
Sweat in 1 hr (oz)	4.82	3.67	5.43	3.14
Sweat in 2 hrs (oz)	10.41	9.87	12.11	10.22

[a]Effects of clothing are statistically significant.
[b]Effects of relative humidity are statistically significant.

these observations on similarly clothed women were the same whether the relative humidity was low (30 percent) or high (80 percent) as shown in Table 2. The mean skin temperature of the women wearing summer clothing was statistically significantly higher than that of the women wearing union suits. This was true in both low and high relative humidity conditions. The women stabilized with significantly lower skin temperatures and lower rates of evaporative heat loss than did the men, Table 3. The thermal sensations of the women were the same whether dressed in union suits or summer clothing and whether exposed to either dry or moist environmental conditions.

Heat Exposure

Immediately on entering the hot room there was the prompt rise in mean skin temperature and the slight initial decline in rectal temperature shown in Fig. 1 and Table 2 similar to the changes observed in men. The increase in mean skin temperature is graphically shown in Fig. 1 as a function of time. The promptness with which temperatures rise is noteworthy. Fig. 1 and Fig. 2 show that, regardless of the costume, the skin temperatures reached higher levels in 10 min when the women came from a 30 percent than from an 80 percent RH room. Individuals who had higher skin temperatures in the comfortable room also reached higher temperatures in the hot room. The significant factor appears to be the relative humidity of the comfortable room from which the subjects came as indicated in Fig. 2 by the separate lines for each humidity condition of previous exposure.

Immediately after entrance to the hot room there was an increase in weight of the subjects. The technical difficulties involved in accurately following these weight gains prevented a comparison of the gains of subjects coming from the 30 and 80 percent RH environments. It would appear that the increase in weight represented condensation of water in the clothing and that the

Table 3—Comparison of Physiological Responses of Men and Women Dressed in Union Suits when Exposed to a Hot Humid Room for One Hour and Followed by Exposures to a Comfortable Room with a 30 percent RH and 76 F

Observations	Physiological Adjustments	
	Men[a]	Women
Mean Skin Temperature (F)		
Level before heat exposure	92.31	91.57[b]
Increases in 10 min	4.35	5.27[b]
Level after one hour of heat	96.58	97.22
Decreases in 10 min after heat	6.29	6.47
Level after one hour in comf. room	89.33	90.18
Rectal Temperatures (F)		
Level before heat exposure	98.30	98.41
Decreases in 10 min	0.13	0.11
Level after one hour of heat	98.70	98.74
Increase in 10 min after heat	0.14	0.26
Level after one hour in comf. room	98.23	98.59
Thermal Sensations		
Before heat exposure	4.1	4.0
On entrance to hot room	6.0	6.1
After one hour of heat	6.3	6.7
On entrance to comfortable room	1.7	2.1
After one hour in comfortable room	4.0	3.9
Water Losses		
Rate before heat exposure (Btu per (hr) (sq ft))	5.79	4.97[b]
Time of visible sweat in hot room min.	9.9	19.8[b]
Rate during hour of heat exposure (Btu per (hr) (sq ft))	12.66	5.20[b]
Amount of Sweat (oz)	8.76	4.83[b]
Accumulated sweat from heat exposure (oz per sq ft)	0.30	0.23
Rate of Evaporation in comfortable room after heat exposure (Btu per (hr) (sq ft))	13.72	13.67

[a]Data from reference (1) for men.
[b]Observations for the men and women are statistically significantly different.

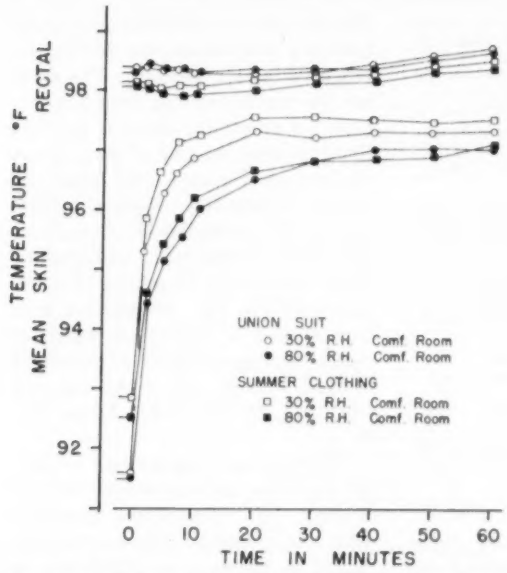


Fig. 1—Responses of skin and rectal temperatures upon exposure to a hot humid environment of women dressed in summer clothing or union suit when previously exposed to a 30 and 80 percent RH of the comfortable room

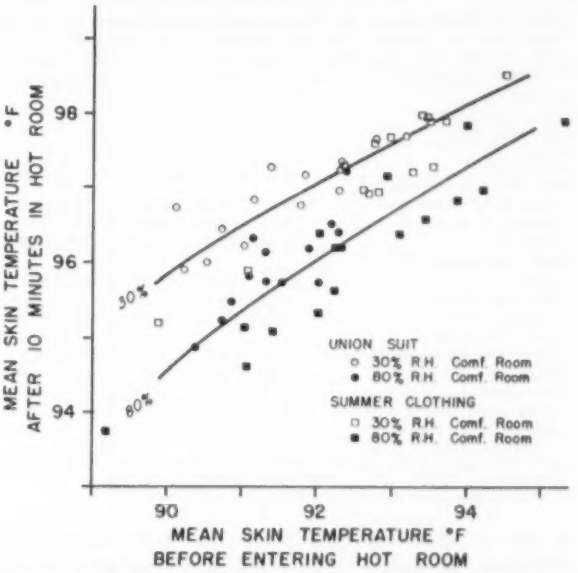


Fig. 2—Relationship of the level of mean skin temperature after 10 min in hot room to level of mean skin temperature before entering hot room when women were dressed in either union suit or summer clothing and previously exposed to either a 30 or 80 percent RH comfortable room

subject coming from the 30 percent RH environment should show greater gains.

Visible sweat on the face, neck or back of hands of the women was noted on the average in about 20 min. This is markedly later than for the men, see Table 3. Sweating per unit area was also less than for the men. The reader will note that the levels of skin temperatures attained in 10 min were the same for the women and for the men. The increases in 10 min were greater for the women than for the men and were due to their lower skin temperatures in the comfortable room, see Table 3.

The maximum skin temperatures of the women, regardless of costume, were attained in 1 hr and maintained throughout the second hour. The rectal temperatures rose 0.2 to 0.4 F deg in the first hour and an additional 0.5 to 0.6 F deg in the second hour. The continued elevation of rectal temperatures indicated further heat storage. The thermal sensations were the same throughout both hours, and apparently were not influenced by the amount of heat stored. The gradient attained between rectal and mean skin temperatures was 1.5 F deg. These observations are similar to those reported for men subjected to the same experimental conditions, see Table 3.

On Return to the Comfortable Room

On re-entry into the comfortable room there was a sudden sensation of coolness; the skin of the face and neck became dry rapidly. The thermal sensation returned slowly to a normal range. The observations on the physiological adjustments of the women dressed in either union suits or summer clothing within the comfortable rooms (30 and 80 percent RH) are summarized in Table 4. From a study of Fig. 3 it will be noted that the skin temperatures manifested rapid decreases, which were essentially completed by the end of 10 min, and further slowly falls throughout the remainder of the hour. It will be noted, from Fig. 3 and Table 4, that during the first 10 min greater decreases occurred in the 30 percent RH in contrast to an 80 percent RH environment with women dressed in union suits and in summer clothing. Further, greater decreases occurred in women dressed in union suits as compared to those dressed in summer clothing when exposed to similar relative humidity environments.

During the first 10 min the rectal temperatures and the thermal sensations experienced by the women were the same, regardless of the relative humidity or the costume.

In the remaining 50 min the skin temperature drops were slower, and appeared to be related to the quantity of accumulated sweat, the evaporation of which tended to delay the rise in skin temperatures. The rectal temperatures were similar with the two types of clothing and with either low or high relative humidity environments, see Table 4. These points will be discussed more completely in a subsequent paragraph. Nevertheless, the women felt nearly comfortable by the end of the hour in each experimental condition.

When comparing the adjustments of men and women returning to a comfortable room with clothing saturated with sweat, it is noted in Table 3 that the cooling of the skin, the thermal sensation, and the evaporation per unit area were the same for women and men.

Interpretation of Data (With Respect to Relative Humidity)

On entering the hot room the major physical causes for the rapid rise

Table 4—Observations on Physiological Adjustments of Women Clothed in Either Union Suit or Summer Clothing Exposed to a Comfortable Environment of Either 30 or 80 Percent RH After Having been Exposed to a Hot Humid Environment

Observations	Physiological Adjustments to Rapid Cooling							
Type of Clothing	Union Suit				Summer Clothing			
Relative Humidity of comfortable room	30 percent		80 percent		30 percent		80 percent	
Duration of heat exposure	1 hr	2 hrs	1 hr	2 hrs	1 hr	2 hrs	1 hr	2 hrs
Mean Skin Temperature (F)								
Level at end of hot room	97.22	97.82	96.97	97.52	97.14	97.57	97.09	97.44
Decrease in 10 min	6.47	6.35	4.64[b]	4.66[b]	4.63[a]	5.01[a]	3.36[ab]	3.55[ab]
Level at 1 hr	90.18	89.59	91.45[b]	90.87[b]	91.01	90.05	92.78[ab]	92.09[ab]
Rectal Temperature (F)								
Level at end of hot room	98.74	99.40	98.64	99.06	98.53	99.20	98.39	99.00
Maximum increase in 10 min	0.26	0.13	0.23	0.19	0.28	0.13	0.29	0.13
Level at 1 hour	98.59	98.91	98.60	98.64	98.45	98.74	98.40	98.57
Thermal Sensations								
On entrance to comfortable room	2.1	2.1	2.1	2.6	1.6	1.8	2.0	2.0
After 1 hr	3.9	3.8	3.9	3.9	3.9	3.8	4.0	4.0
Water Losses								
Accumulated sweat (oz)	4.09	5.73	4.20	6.25	4.55	8.20	4.03	7.00
Evaporation in 1 hr (Btu per (hr) (sq ft))	12.42	14.46	8.63[b]	10.93[b]	12.38	14.55	9.94[b]	10.47[b]

[a]The effects of different types of clothing are statistically significant.
[b]The effects of relative humidity are statistically significant.

in skin temperatures were the condensation of moisture on the clothing and the addition of heat by radiation and convection. The thermal effects of condensation are opposite to those due to the evaporation of sweat. Dry clothing exposed to an environment of low relative humidity, in contrast to the same clothing exposed to an environment of high relative humidity, permits greater condensation of atmospheric moisture on entering a hot humid environment.

The effect of relative humidity on the physiological adjustments to sudden cooling was clearly shown in Fig. 3. A 30 percent, in contrast to an 80 percent RH environment, caused the faster and greater decrease of mean skin temperatures of similarly clothed women, Table 4. This 50 percent difference in relative humidity was responsible for the divergence in skin cooling. The manner in which relative humidity exerted its effect was through its ability to regulate the rate of evaporation of the pool of accumulated sweat, see Fig. 4. It was this evaporative cooling which immediately determined the course of the rapid adjustments. Thus, as early as 10 min, a 15.6 Btu per (hr) (sq ft) evaporative heat loss caused a greater decrease in mean skin temperature of similarly clothed women than a 9.3 Btu per (hr) (sq ft) loss, Table 5 and Fig. 5.

Evaporation supplements cooling by radiation and convection. In the absence of evaporation, however, heat loss by radiation and convection would be the same in either low or high relative humidity environments. Relative humidity indirectly affected heat loss by radiation and convection of similarly clothed subjects by altering the temperature gradient between clothing and walls, see Fig. 3. Increases in rates of heat loss by evaporation, upon exposure to a low as compared to a high relative humidity

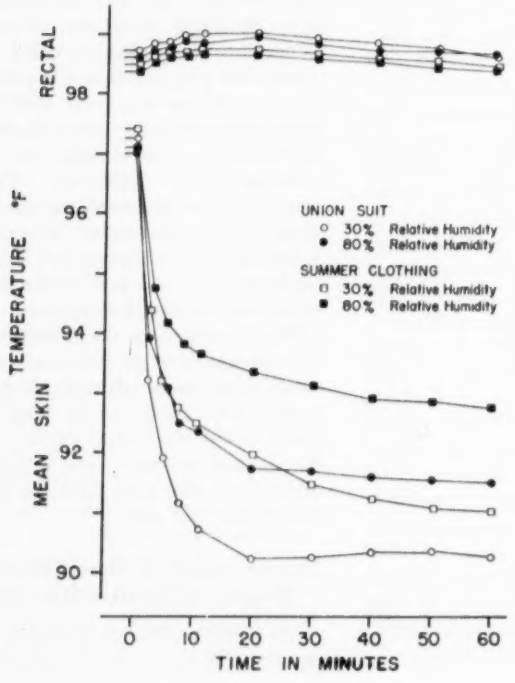
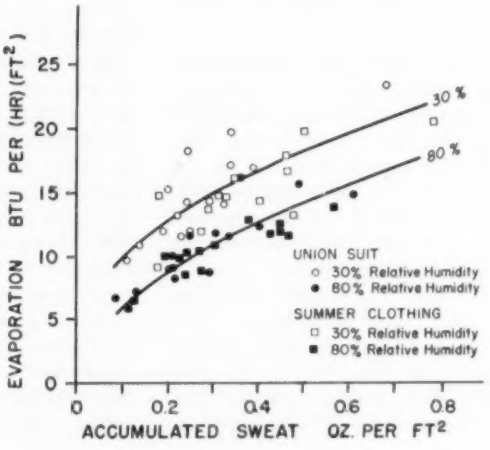


Fig. 3—*(Left)* Responses of skin and rectal temperatures after 1 hr heat exposure of women dressed in either union suit or summer clothing and exposed to a 30 or 80 percent RH comfortable room

Fig. 4—Relationship of accumulated sweat to its evaporation for women dressed in union suit or summer clothing and exposed to a 30 and 80 percent RH comfortable room



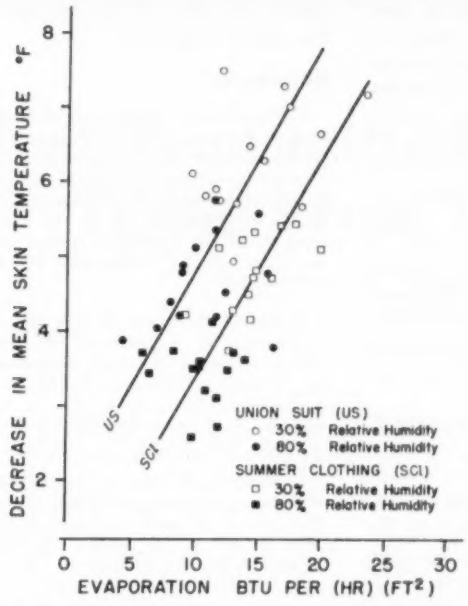


Fig. 5—Effects of evaporation on decrease in mean skin temperature in 10 min of women dressed in either union suit or summer clothing and exposed to either 30 or 80 percent RH comfortable room

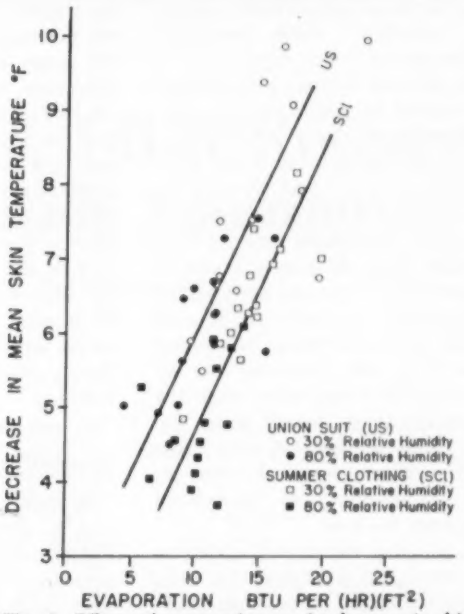


Fig. 6—Effects of evaporation on the decrease in skin temperature after 1 hr in a comfortable room with either a 30 or 80 percent RH. The women were dressed in either union suit or summer clothing

environment, cause reduction in heat loss by radiation and convection.

The relative humidity, in the presence of an adequate supply of accumulated sweat, determines the course of skin temperatures after the completion of the initial rapid adjustments. During this period of 50 min, its influence was exerted on evaporation; the greater evaporative heat loss caused a greater skin temperature drop during the hour as shown in Fig. 6. For complete evaporation of the sweat, greater quantities of heat from the body were required and necessitated prolonged periods of lowered skin temperatures. Excessive body cooling by rapid evaporation was prevented by the vaso-motor mechanisms. This is shown by the maintenance, during the entire hour, of the same rectal temperatures.

Interpretation of Data (With Respect to Clothing)

The mean skin temperature in the comfortable room was higher (statistically significant) with summer clothing than with union suits. This is explained by the greater insulation offered by the summer clothing. The lesser increments in skin temperature on entering the hot room are, therefore, to be expected since all subjects stabilized at the same skin temperature in the hot room as shown in Table 2.

The effect of the two types of clothing was clearly shown in Fig. 3 when the women were exposed to the comfortable room after heat exposure. The summer clothing, in contrast to the union suit, decreased the rate of skin cooling of women exposed to similar environments, Table 5. The differences in the types of clothing are responsible for the diverging skin temperatures curves.

At this point it should be well to indicate the physical differences in the two types of clothing. The summer clothing offered a triple layer insulation with air spaces between

Table 5—Observations on Physiological Adjustments of Women Dressed in Either Union Suit or Summer Clothing to Sudden Changes from a Hot Humid Environment to a Comfortable Environment are Compared by Grouping Data into Low and High Evaporative Heat Losses

Observation	Physiological Adjustments to Cooling after Heat Exposure			
Type of Clothing	Union Suit		Summer Clothing	
Average Evaporative heat loss (Btu per (hr) (sq ft))	9.3	15.6	9.3	14.5
Mean Skin Temperature (F)				
Level at end of heat exposure	97.17	97.66	97.25	97.35
Decrease in 10 min	4.94	6.01[b]	3.53[a]	4.47[a,b]
Level in 1 hr	91.27	89.88[b]	92.54[a]	91.09[a,b]
Rectal Temperatures (F)				
Level at end of heat exposure	98.71	99.26[b]	98.57	98.86[a]
Maximum increase in 10 min	0.22	0.18	0.25	0.20
Level after 1 hr	98.49	98.87[b]	98.42	98.61
Thermal Sensations				
On entrance to comfortable room	2.4	2.1	2.1	1.7
After 1 hr	3.9	3.8	4.0	3.6
Water Losses				
Accumulated sweat (oz)	3.69	6.70[b]	4.74	7.22[b]

[a]Effects of clothing are statistically significant.
[b]Effects of evaporative heat losses are statistically significant.

layers; the union suit offered a single layer insulation. Both permitted free passage of water vapor.

The effects of clothing were further demonstrated by relating evaporative heat loss for the hour in each subject to the decrease in mean skin temperature in 10 and 60 min as shown in Figs. 5 and 6, respectively. Each type of clothing had its own regression line; these were found to be significantly separate upon statistical analysis. It can then be said that the summer clothing, in contrast to the union suit, permitted less decrease in skin temperature when the evaporative heat losses were the same. This is also shown in Table 5. The effects were observed as early as 10 min and maintained throughout the hour.

The summer clothing required the body to maintain higher skin temperatures to force through the clothing the same amount of radiative and convective heat which is lost through the union suit under circumstances of equal rates of evaporative heat loss. The differences in skin temperature after complete evaporation of the accumulated sweat should be maintained or should approach those differences existing before heat exposure.

Interpretation of Data (With Respect to Sex)

The literature contains few references to studies of heat loss in women[3] although their lower heat production (basal metabolism) has been extensively studied. In terms of adaptability to sudden heat exposure, women can reach the same maximal skin temperatures just as promptly as men, even though they start from lower levels. This response is subject to further study. The slowness of initiating sweat in women had been previously reported[4]. In this regard the data compiled by the authors confirm those of DuBois[4]. The lower rate of sweating in women as compared to men is also confirmed.

The thermal sensations showed that the sexes adjust with equal promptness. Within the experimental ranges studied, the behaviors of the sexes were quite similar and indicate that the presence of men and women in the same space does not require alterations in accepted specifications for its air conditioning. The similarities in the other observations of men and women subjected to rapid cooling are perhaps explained by the high rates of evaporative cooling. This is also under further study in view of the well established fact that the higher fat content in the body of women[5] may be physiologically active as an insulating mechanism during exposures to cold environments.

Conclusion

Women adjust as readily as do men to sudden entrance into a hot humid environment. Their skin temperatures rise promptly, even faster than is observed for men. Sweat is slower to appear than in the case of the men.

As women leave a hot humid room and enter one which is normally comfortable, they feel cool, stop sweating promptly, and rapidly adjust their skin temperatures much as do men. This adjustment is controlled by: (1) sweat accumulated in their clothing and available for evaporative heat loss; (2) relative humidity; and (3) clothing.

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Heat Transmitted to the I-B-R Research Home From the Inside Chimney

By W. S. Harris* and R. J. Martin**,
Urbana, Ill.

SUMMARY—The heat derived from a chimney is usually ignored in calculating heat requirements of rooms through which a chimney passes. This study indicates that an inside chimney may supply 11 to 30 percent of the normal heat requirements of the rooms to which the sides of the chimney are exposed.

A procedure for correcting the calculated heat loss of rooms for the heat gain from the chimney is given.

WHEN DESIGNING a heating system for a house it is common practice to assume that the room heat losses are a function of the indoor-outdoor temperature difference only, and that the sole source of heat input to each room is the room heating unit. Actually, while heat losses are primarily dependent upon the indoor-outdoor temperature difference, such factors as the direction and intensity of the wind, and the amount of sunshine also have an effect on the actual heat loss. Moreover, the room heating unit is not the only source of heat input to the rooms. In addition to the heat supplied to the rooms by the room heating unit, heat is also obtained from such sources as lights, people, cooking, heating pipes and heat losses from the boiler and chimney. Early tests in the *I-B-R* Research Home showed that about as much heat was supplied to the rooms by these *stray* sources as by the room heating units themselves. Furthermore, it was observed that those rooms through which the inside chimney passed were overheated even though the heat losses were estimated with extreme care and the radiation was selected in accordance with the estimated heat loss. To correct this unbalance in room temperature it was necessary to remove as much as 35 percent of the radiation originally installed in those rooms through which the chimney passed.

These observations seemed to indicate that a rather large amount of heat was being transmitted through the walls of the chimney to the room air. This paper is confined to a discussion of tests made in the *I-B-R* Research Home at the University of Illinois to determine the amount of heat supplied to the house in this way when the house was being heated by an oil-fired, forced-circulation hot water heating system. The results are compared with the results of investigations made at the National Bureau of Standards and at *Battelle Memorial Institute*. A method of allowing for the effect of chimney heat in the design of residential heating systems is suggested. The limitations of this paper do not permit a complete discussion of test procedure and computation methods; however, a more detailed report has been prepared and will be published as University of Illinois Engineering Experiment Station Bulletin No. 407. Readers desiring a more complete treatment of test methods and computations are referred to that publication.

Test Equipment

Construction details and the floor plans of the Research Home are shown in Fig. 1. The calculated coefficient of heat transmission for the wall section was 0.074 Btu per (hr) (sq ft) (F deg). All windows and doors were weather-stripped. The total calculated heat loss under design conditions of −10 F outdoors and 70 F indoors was 43,370 Btu per hr for the house, excluding the basement.

A one-pipe, forced-circulation, hot-water heating system was used. The oil-fired, cast-iron boiler had a net *I-B-R* rating of 63,000 Btu per hr or a gross *I-B-R* output of 95,000 Btu per hr when fired at the rate of 1.0 gal of oil per hr. Small-tube type 19-in., 4-tube, cast-iron radiators set in open recesses below windows were used to transfer the heat from the boiler water to the room air. The radiators were connected to two supply loops located in the basement as shown in Fig. 2. The locations of all radiators are shown by the black rectangles in Fig. 1. The amount of radiation installed in each room was based on a heat emission rate of 200 Btu per sq ft EDR (Equivalent Direct Radiation) with a mean water temperature of 195 F, and was just sufficient to offset the calculated heat loss at an outdoor temperature of −10 F at these design conditions. The chimney to which the boiler was connected had a height of 35 ft 2 in. measured from the basement floor

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and it consisted of a 6½ in. x 11 in. fireclay flue lining enclosed by one course of red brick. The chimney extended up through the central part of the house so that it was completely surrounded by heated space from its base to the level of the second story ceiling. There was no direct contact between the chimney and any part of the house framing. The plaster walls were separated from the masonry by an air space averaging about 5 in. in width. At the second story and basement ceiling levels this space was packed with mineral wool to prevent the circulation of air between the space around the chimney and the attic or basement. The details of the chimney construction, flue connection, and thermocouple locations are shown in Fig. 3.

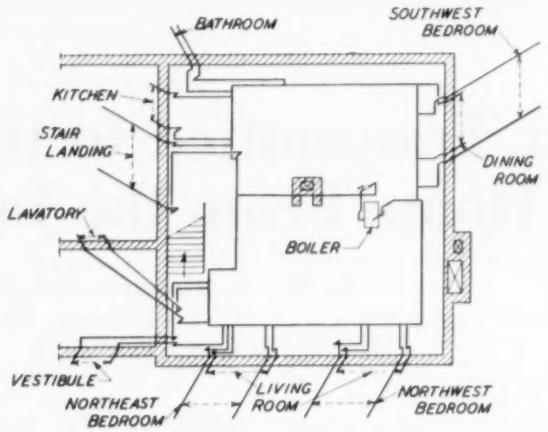


Fig. 2—Basement heating plan

Test Procedure

During the tests included in this discussion the flow control valve was locked open so that water could circulate to the radiators by gravity during the offperiod. The operations of the burner and circulator were controlled by the room thermostat alone. No provision was made for heating domestic hot water. The oil burning rate of 1.1 gal per hr was the minimum obtainable with a clean fire and with a CO_2 content of the flue gases not less than 8 percent at the flue outlet of the boiler. The oil weighed 7 lb per gal and had a calorific value of 19,550 Btu per lb. In order to keep a constant draft on the boiler at all times, a draft regulator was installed in the flue pipe connecting the boiler to the chimney.

During all tests the temperature of the air 30 in. above the floor in the heated portion of the house was maintained constant at approximately 72 F, both day and night. The windows, including those in the bedrooms, remained closed at all times.

Each test was 24 hours in length and continuous records were made of (1) the chimney gas temperatures at the levels of the attic floor, the basement ceiling, and at the flue outlet of the boiler; (2) the draft in the chimney at the level of the basement ceiling; (3) the temperature of the water at the boiler outlet and return; and (4) the outdoor air temperature. Periodically each day observations were recorded of (1) the temperature of the air in each room at 3 in., 30 in., and 60 in. above the floor and 3 in. below the ceiling; (2) the temperature of the air in the basement and in the attic; (3) the surface temperatures of the plaster on the room walls surrounding the chimney; and (4) the CO_2 content of the chimney gases at the flue outlet of the boiler and at the level of the attic floor. Daily records were made of: the operating time, number of cycles and power consumption of the burner and circulator, and the weight of oil consumed.

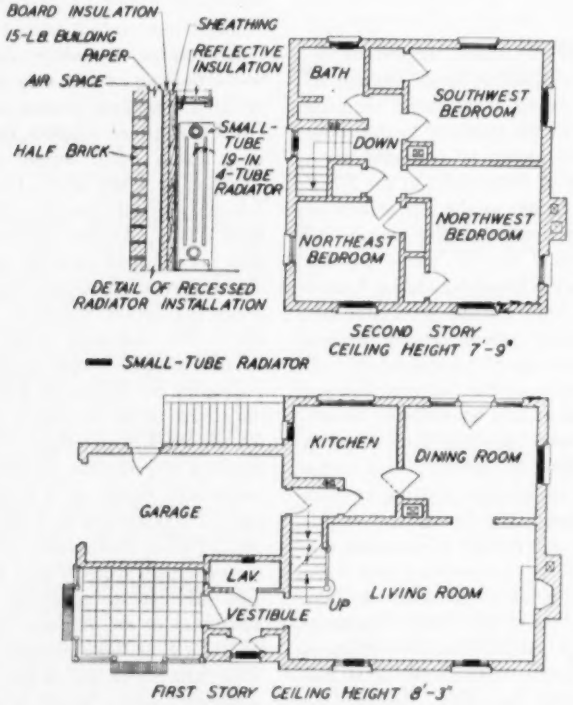


Fig. 1—Construction details and floor plan of Research Home

Computations

The heat supplied to the house from the chimney was computed by two methods. One method was based on observed flue gas temperatures and rates of flow while the other was based on observed temperatures of the room air and of the plaster wall surrounding the chimney.

Flue Gas Measurement Method. The heat supplied to the heated portion of the house from the chimney gases may be divided into three parts consisting of (1) the heat obtained from the dry chimney gases; (2) the heat obtained from the water vapor in the chimney gases formed by the combustion of hydrogen in the fuel; and (3) the heat obtained from the water vapor in the chimney gases carried in by the air for combustion.

Based on the assumption that all of the heat given up by the flue gases while passing from the level of the basement ceiling to the level of the attic floor is transmitted directly to the heated portion of the house, the heat obtained from the dry chimney gases during either the off- or on-period may be computed from the equation:

$$H = W_d C_p (t_b - t_c) \theta \quad \ldots\ldots (1)$$

where

H = heat obtained from the dry chimney gases, Btu.

W_d = average rate of flow of the dry chimney gases, pounds per hour.

C_p = specific heat of chimney gases, 0.24 Btu per (pound) (Fahrenheit degree).

t_b = average temperature of the chimney gases at the level of the basement ceiling, Fahrenheit.

t_c = average temperature of the chimney gases at the level of the attic floor, Fahrenheit.

θ = time, hours.

The heat obtained from the water vapor in the chimney gases formed by the combustion of hydrogen in the fuel during the on-period may be computed from the equation:

$$H_c = 0.09\, W_o H_2 C_{pv} (t_b - t_c)\, \theta \quad \ldots (2)$$

where

H_c = heat obtained from water vapor formed by the combustion of hydrogen in the fuel, Btu.

W_o = weight of oil burned, pounds per hour.

H_2 = hydrogen in the fuel, percent by weight.

C_{pv} = specific heat of the water vapor, 0.46 Btu per (pound) (Fahrenheit degree).

In addition to the water vapor resulting from the combustion of hydrogen in the fuel, about 0.005 lb of water vapor were supplied with each pound of basement air admitted to the system. The heat regained from the water vapor in this air was less than 1.0 percent of the total heat regained and therefore was neglected in all calculations.

The rate of flow of chimney gases was not continuous and uniform, and

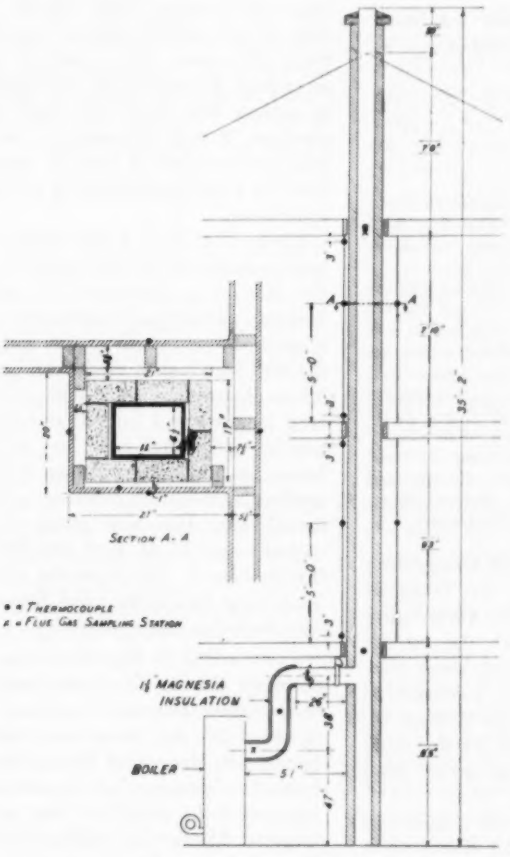


Fig. 3—Chimney details

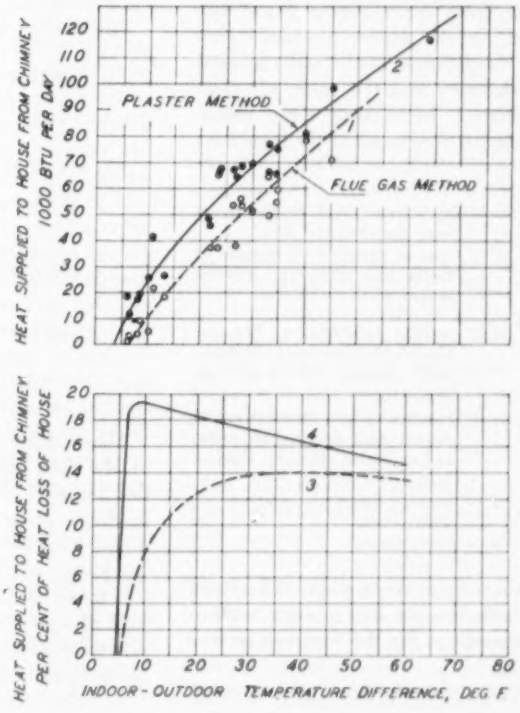

HEAT SUPPLIED TO HOUSE FROM CHIMNEY 1000 BTU PER DAY
PLASTER METHOD
FLUE GAS METHOD
HEAT SUPPLIED TO HOUSE FROM CHIMNEY PER CENT OF HEAT LOSS OF HOUSE
INDOOR-OUTDOOR TEMPERATURE DIFFERENCE, DEG F

Fig. 4—Heat supplied to house from inside chimney when operating oil-fired boiler

it was not possible to calculate the rate of flow during the off-periods from the analysis of the fuel and the chimney gases as was possible for the on-periods. Hence, it was immediately evident that in order to use Equations 1 and 2 to calculate the amount of heat transmitted to the house from the flue gases over the period of a day, the on-periods and the off-periods would have to be treated separately.

The total heat transmitted to the house from the chimney gases during each on- and off-period of the burner was obtained by substituting in Equations 1 and 2 the proper values of gas flow rates and temperatures, and the analysis and weight of oil burned as obtained by test measurement.* The total heat transmitted to the house from the chimney gases during any given day was obtained by taking the sum of the heat transfers computed for the individual cycles occurring during that day.

Plaster Surface and Room-Air Temperature Method. A second method used in computing the amount of heat transmitted to the house from the chimney gases was based on the observed plaster surface temperature of the walls around the chimney and the room air temperatures. In making these calculations use was made of the equation:

$$H_p = A\, f_1\, (t_s - t_a)\, \theta \quad \ldots\ldots\ldots (3)$$

where

H_p = heat transmitted to the house from the chimney, Btu.

A = area of plaster wall exposed to rooms and enclosing chimney, square feet.

f_1 = surface conductance, Btu per (hour) (square foot) (Fahrenheit degree) = 1.65 (assumed).

t_s = average surface temperature of plaster wall exposed to rooms and enclosing chimney, Fahrenheit.

t_a = average room air temperature, Fahrenheit.

θ = time, hours.

Since there were slight differences in both the air and plaster surface temperatures for the first and second stories, the heat transfer was computed for each story separately as follows:

$$h_1 = A_1 f_1\, (t_1 - t_3)\, \theta \quad \ldots\ldots\ldots (4)$$

$$h_2 = A_2 f_1\, (t_2 - t_4)\, \theta \quad \ldots\ldots\ldots (5)$$

$$H_p = h_1 + h_2 \quad \ldots\ldots\ldots (6)$$

where

h_1 and h_2 = heat transmitted from chimney to first and second story rooms respectively, Btu.

A_1 and A_2 = areas of plaster wall exposed to rooms and enclosing chimney on first and second stories respectively, square feet.

t_1 and t_2 = average surface temperatures of A_1 and A_2 respectively, Fahrenheit.

t_3 and t_4 = average room air temperatures of first and second stories respectively, Fahrenheit.

The average room air temperature of the first story, t_3, was taken as the average of the air temperature readings observed each day at the 60-in. level in the living room, dining room, and kitchen. Likewise, t_4, was taken as the average of the readings observed each day of the room air temperature at the 60-in. level in the three bedrooms.

In calculating the total quantity of heat transmitted to the rooms from the chimney each day, Equations 4 and 5 may be further simplified by combining all constant terms to:

$$h_1 = c_1\, (t_1 - t_3) \quad \ldots\ldots\ldots (7)$$

$$h_2 = c_2\, (t_2 - t_4) \quad \ldots\ldots\ldots (8)$$

in which the constants c_1 and c_2 are as follows:

$c_1 = A_1 f_1\, \theta = 81 \times 1.65 \times 24 = 3208$

$c_2 = A_2 f_1\, \theta = 72.8 \times 1.65 \times 24 = 2887$

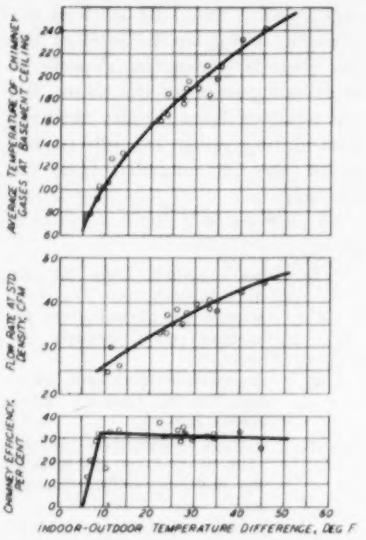

AVERAGE TEMPERATURE OF CHIMNEY GASES AT BASEMENT CEILING
FLOW RATE AT STD DENSITY, CFM
CHIMNEY EFFICIENCY, PER CENT
INDOOR-OUTDOOR TEMPERATURE DIFFERENCE, DEG F

Fig. 5—Chimney efficiency and gas flow rates

Results

Heat Transmitted to House from Chimney Computed by the Flue Gas Temperature Method. In Fig. 4, curve 1 shows the daily heat transmitted to the house from the chimney as determined by measurements of flue gas temperatures and quantities. The test points are quite scattered as is to be expected since the coordinates selected imply that the heat transfer was a function only of indoor-outdoor temperature difference. Actually, it was a function of total burner operating time, boiler water temperature and intensity of draft, all of which were affected by the amount of sunshine and average wind velocity as well as the indoor-outdoor temperature difference. Since the test observations did not make it possible to isolate the effects of wind and sunshine, it was necessary to run a sufficient number of tests to permit drawing a curve representing *average* conditions.

Curve 3 of Fig. 4 represents the heat transferred to the house from the chimney as determined by measurements of flue gas temperatures and quantities, expressed in percent of the total heat loss of the house. Curve 3 was obtained by multiplying values read from curve 1 by 100 and dividing by the actual heat loss of the house for the corresponding indoor-outdoor temperature difference. This actual heat loss was obtained by measurement of all heat supplied to the Residence. A discussion of the actual heat loss of the *I-B-R* Research Residence has been published[1].

From curve 3, Fig. 4, it may be observed that as the indoor-outdoor temperature difference increased up to about 25 deg there was a sharp increase in the useful heat obtained from the chimney when expressed in percent of the total heat loss of the house. Above an indoor-outdoor

*Readers interested in a complete description of the experimental methods used to obtain the proper values to substitute in Equations 1 and 2 should refer to *University of Illinois Engineering Experiment Station Bulletin* No. 407 (To be published.)

[1]Exponent numerals refer to References.

temperature difference of 25 deg this increase was less pronounced, ranging from 13.5 percent to a maximum of 14 percent. At an indoor-outdoor temperature difference of 34 deg, (representative of average winter temperatures in Urbana, Ill.) the heat supplied to the house from the chimney as computed by the flue gas method amounted to 14.0 percent of the total heat loss of the house.

Heat Supplied to House from Chimney Computed by Plaster Surface Temperature Method. The useful heat obtained from the chimney each day as computed from the observed plaster surface and room air temperatures is shown in curve 2 of Fig. 4. The test points for curve 2 are for the same days as those for curve 1 and supposedly they would have identical values if both methods of calculation were exact. However, both methods of computation are subject to some unavoidable inaccuracies. The correlation of the test points for curve 2 in Fig. 4 is better than that for curve 1, and there is reason to believe that these points represent more accurately the actual heat transmission rates than do the points for curve 1 since fewer approximations are involved.

Curve 4 which was based on curve 2 and calculated in the same manner as curve 3, indicates that as soon as the outdoor temperature dropped low enough to require some heat in the house the useful heat obtained from the chimney expressed in percent of the total heat loss of the house rose very sharply from 0 to 19.5 percent. As the indoor-outdoor temperature difference increased the ratio of the heat obtained from the chimney to the heat loss of the house steadily decreased to a value of about 14.7 percent at an indoor-outdoor temperature difference of 60 deg. At a temperature difference of 34 deg the useful heat obtained from the chimney as computed from observed plaster surface and ambient air temperatures, was about 17 percent of the actual heat loss of the house, as compared to the value of 14.0 percent obtained by using observed flue gas temperatures and rates of flow in computing the useful heat obtained from the chimney.

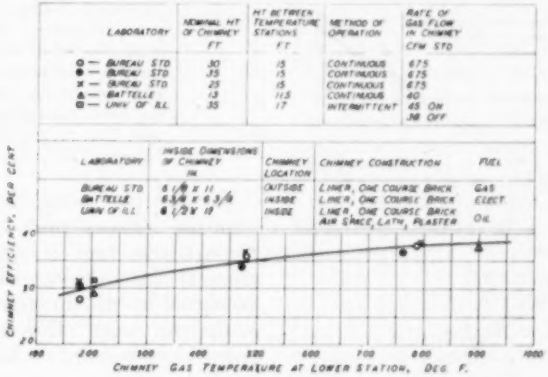

LABORATORY
NOMINAL HT OF CHIMNEY FT
HT. BETWEEN TEMPERATURE STATIONS FT
METHOD OF OPERATION
RATE OF GAS FLOW IN CHIMNEY CFM STD
BUREAU STD 30 15 CONTINUOUS 675
BUREAU STD 35 15 CONTINUOUS 675
BUREAU STD 25 15 CONTINUOUS 675
BATTELLE 13 11.5 CONTINUOUS 40
UNIV OF ILL. 35 17 INTERMITTENT 45 ON .38 OFF
LABORATORY
INSIDE DIMENSIONS OF CHIMNEY IN
CHIMNEY LOCATION
CHIMNEY CONSTRUCTION
FUEL
BUREAU STD 8 1/8 x 11 OUTSIDE LINER, ONE COURSE BRICK GAS
BATTELLE 8 3/4 x 8 3/4 INSIDE LINER, ONE COURSE BRICK ELECT.
UNIV OF ILL 8 1/2 x 13 INSIDE LINER, ONE COURSE BRICK AIR SPACE, LATH, PLASTER OIL
CHIMNEY EFFICIENCY, PER CENT
40
30
20
100
200
300
400
500
600
700
800
900
1000
CHIMNEY GAS TEMPERATURE AT LOWER STATION, DEG. F.

Fig. 6—Chimney efficiencies

Chimney Heat Transfer Efficiency. The heat transmitted to the house from the inside chimney may be expressed as a percentage of the heat available in the chimney gases at the basement ceiling level. Since this value represents the heat transferred as related to the initial heat available, it may be designated *Chimney Heat Transfer Efficiency* or simply *Chimney Efficiency.* The chimney efficiency was determined over a range of indoor-outdoor temperature differences by means of observed rates of flow of the chimney gases and the temperatures of these gases at the basement and second story ceiling levels. A plot of the chimney efficiencies together with the average flow rates and temperatures of the chimney gases at the basement ceiling level is shown in Fig. 5. The chimney efficiency was fairly constant over a wide range of indoor-outdoor temperature differences and was equal to 31 percent at an indoor-outdoor temperature difference of 34 deg, which is representative of average winter temperature in Urbana, Ill.

In addition to the investigation reported in this bulletin, studies of the performance of residential chimneys have been made at the National Bureau of Standards[2] and *Battelle Memorial Institute*[3]. While masonry chimneys were being studied in all cases, there were variations in the physical dimensions of the chimneys, the method of operation, and the type of fuel used as shown in Fig. 6. While the total height of the chimneys differed, it should be noted that the heights between temperature measuring stations used for computing the chimney efficiency were approximately equal.

From the data of the tests conducted at the National Bureau of Standards and *Battelle Memorial Institute*, chimney efficiencies were computed and plotted in Fig. 6 as a function of the average temperature of the chimney gases observed at the lower measuring station. Superimposed on this plot is the chimney efficiency which was obtained in the Research Home for an average temperature of the chimney gases at the basement ceiling level of 208 F, obtained at an indoor-outdoor temperature difference of 34 deg (see Fig. 5). The results of the three investigations are in close agreement even though there were differences in cross-sectional areas, total heights, and methods of operation of the various chimneys.

In residential operation, the average temperature of the chimney gases will normally approximate 200 F, and should not exceed 500 F. It should be remembered that these are not maximum temperatures, but average temperatures for both on-period and off-period operation, and furthermore, they are affected by the entrance of basement air through the draft regulator. Therefore, it would

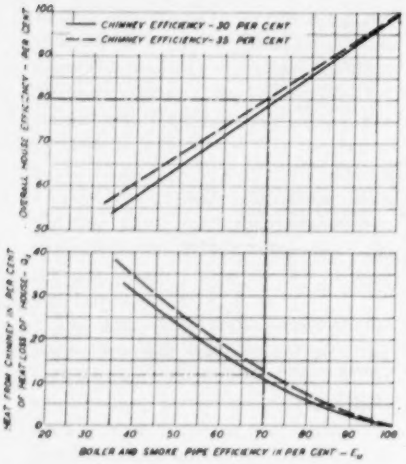

CHIMNEY EFFICIENCY - 30 PER CENT
CHIMNEY EFFICIENCY - 35 PER CENT
OVERALL HOUSE EFFICIENCY - PER CENT
HEAT FROM CHIMNEY IN PER CENT OF HEAT LOSS OF HOUSE - Q_c
BOILER AND SMOKE PIPE EFFICIENCY IN PER CENT - E_u

Fig. 7—Relation between heat from chimney and operating efficiencies

appear that a chimney efficiency of 30 to 35 percent could be expected for an inside masonry chimney having a length of travel through the heated portion of the house of approximately 15 ft.

Heat Utilization. The amount of fuel required to offset the heat loss of the house is affected by the heat supplied to the house from the inside chimney. However, the heat from the chimney is not necessarily supplied to all rooms of the house in proportion to the heat loss of those rooms. Therefore, the heat supplied by the chimney affects both the utilization of fuel by the house and the distribution of heat within the house.

When the boiler is connected to an inside chimney, it may be assumed that the heat utilized by the house is the total heat available in the fuel burned minus the heat available in the chimney gases at the upper boundary of heated space. This is equivalent to the heat transmitted to the house from the boiler and smoke pipe plus the heat transmitted from the inside chimney and may be expressed as:

$$H_L = H_f E_u + (1-E_u)\, E_c H_f \quad \ldots (9)$$

or

$$H_L = H_f\, [E_u + (1-E_u)\, E_c] \quad \ldots (10)$$

where

H_L = total heat utilized by the house, Btu per hour.

H_f = total heat available in the fuel burned, Btu per hour,

E_u = combined boiler and smoke pipe efficiency; that is, the available heat in the fuel minus the available heat in the chimney gases at the basement ceiling level divided by the available heat in the fuel burned.

E_c = chimney efficiency, decimal.

The heat transmitted to the house from the chimney gases is equal to the available heat in the chimney gases at the basement ceiling level multiplied by the chimney efficiency in decimal form. This may be expressed as a ratio to the heat utilized by the house as:

$$Q_c = \frac{H_f(1-E_u)E_c}{H_f[E_u+(1-E_u)E_c]} \quad \ldots (11)$$

or

$$Q_c = \frac{(1-E_u)E_c}{E_u+(1-E_u)E_c} \quad \ldots (12)$$

where

Q_c = the heat obtained by the house from the chimney gases divided by the heat utilized by the house.

Equation 12 indicates that for any given value of chimney efficiency there is a direct relationship between Q_c, the heat obtained by the house from the chimney divided by the heat utilized by the house; and E_u, the combined efficiency of the boiler and smoke pipe. This relationship is shown in the lower diagram of Fig. 7 for chimney efficiencies of both 30 and 35 percent.

Overall house efficiency has been defined as the heat utilized by the house expressed as a percentage of the total heat available in the fuel burned. Thus, it is a measure of the heat in the fuel burned which is utilized by the house to offset heat losses. The following equation is an expression for overall house efficiency:

$$E_h = (H_L/H_f) \quad \ldots (13)$$

where

E_h = the overall house efficiency, decimal.

By substituting the equivalent of H_L from Equation 10, Equation 13 becomes

$$E_h = E_u + (1-E_u)\, E_c \quad \ldots (14)$$

Thus for any given chimney efficiency there is a direct relation between the overall house efficiency, E_h, and the combined efficiency of boiler and smoke pipe, E_u. This relationship is shown in the top diagram of Fig. 7 for chimney efficiencies of both 30 and 35 percent.

When the chimney efficiency and either the overall house efficiency or the combined efficiency of the boiler and smoke pipe are known, Fig. 7 may be used to determine the heat supplied to the house by the chimney as a percentage of the total heat utilized by the house, Q_c. Thus Q_c is independent of the type of construction of the house, the type of fuel burned, and the indoor-outdoor temperature difference.

As discussed in the preceding section, the range of chimney efficiencies for an inside masonry chimney in a two-story house will normally be between the values of 30 and 35 percent. Results of heating research[4,5] have shown that overall house effi-

Table 1—Data on *I-B-R* Research Homes Illustrating Use of Radiation Selection Procedure

Room	No. of Sides of Chimney Exposed to Room	Calculated Heat Loss Btu per hr	Heat Obtained from Chimney Btu per hr	Net Heat To Be Supplied by Radiation Btu per hr	Reduction in Radiation Required Percent
(1)	(2)	(3)	(4)	(5)	(6)
Living Room	1	5749	650	5099	11.3
Dining Room	2	8742	1300	7442	14.9
Kitchen	1	3199	650	2549	20.3
Lavatory		1484		1484	
Vestibule		4848		4848	
Vestibule Closets					
N.E. Bedroom		4393		4393	
N.W. Bedroom	1	4944	650	4294	13.1
S.W. Bedroom	2	5250	1300	3950	24.8
Bath		2606		2606	
Stair	1	2155	650	1505	30.2
Closets					
Total		43,370	5,200	38,170	12.0

ciencies are generally about 80 percent or less. Thus, in the case of an overall house efficiency of 80 percent and a chimney efficiency of 33 percent, Fig. 7 shows that the combined efficiency of the boiler and smoke pipe must be 70 percent and the heat supplied to the house by the chimney in percent of the total heat utilized by the house, Q_c, must be 12 percent. For a two-story house, this averages 1.5 percent of the total heat utilized by the house for each side of the chimney exposed to a room. At design outdoor temperatures, the total heat utilized by the house is assumed to be equal to the calculated heat loss of the house. Therefore, to maintain uniform temperatures in the various rooms, the heat to be supplied by the installed radiation in a room should be reduced by an amount equal to 1.5 percent of the calculated heat loss of the *house* for each side of the chimney exposed to that room. For example, in a residence with a calculated heat loss of 50,000 Btu per hour, the reduction of installed radiation in a room to which two sides of the chimney are exposed would be equal to 1500 Btu per hour. If the overall house efficiency decreases below 80 percent, the heat obtained from the chimney in percent of the heat loss of the house will increase. For example, at an overall house efficiency of 70 percent, Fig. 7 shows that the heat obtained from the chimney will be about 20 percent of the heat loss of the house. Therefore, the installed radiation as selected by the above procedure should still be adequate.

Correction for Chimney Heat Applied to I-B-R Research Home. Data on the *I-B-R* Research Home are used here to illustrate the use of the procedure just suggested for the selection of radiation. Column 3 of Table 1 gives the total calculated heat loss of each room of the *I-B-R* Research Home at the design indoor-outdoor temperature difference of 80 deg. Conventional practice in the design of a steam or hot water heating system is to provide sufficient radiation in each room to offset this calculated design heat loss. Column 2 indicates the number of sides of the inside chimney which are exposed to the different rooms. Column 4 is the allowance for heat obtained from the chimney, (taken as 1.5 percent of the calculated heat loss of the house for each side of the chimney exposed to the room), and column 5 represents the net heat to be provided by radiation after making allowances for the heat obtained from the chimney.

Using the conventional procedure the radiation would be selected in accordance with the values in column 3 of Table 1. By the procedure suggested in this paper the radiation would be selected on the basis of the values in column 5. Column 6 shows that in the Research Home the heat obtained from the inside chimney was sufficient to take care of from 11 to 30 percent of the normal heat requirements of the rooms to which the sides of the chimney were exposed.

In the description of the first heating system to be installed in the Research Home[5], it was stated that the amount of radiation installed in each room was just sufficient to offset the calculated heat loss of the room (column 3, Table 1). However, to obtain proper balance of room temperatures it was found necessary to reduce the radiation in the dining room and southwest bedroom by 35 and 25 percent respectively, while the radiation in the living room had to be increased by about 9 percent.

In the case of the southwest bedroom the reduction made in the amount of installed radiation corresponded very closely to the reduction indicated by the design procedure suggested in this paper. In the dining room the actual reduction was even greater than that indicated by the estimated chimney allowance. The boiler was located in the basement directly under the dining room and temperatures taken on either side of the dining room floor indicated that additional heat was supplied to this room through the floor.

Only in the living room was the actual change in radiation contrary to that indicated by the proposed procedure. Observations in the Research Home have indicated that the radiation installed in the vestibule was not adequate to keep the vestibule as warm as the remainder of the house. As a result cool air circulated through the open doorway from the vestibule into the living room, increasing the heat requirements of the latter. Had sufficient radiation been installed in the vestibule it is unlikely that additional radiation would have been required in the living room.

Thus, actual performance has indicated that conventional procedures for the selection of radiation have resulted in too much radiation in those rooms of the Research Home to which two sides of the chimney were exposed. Furthermore, had the procedure suggested in this paper been used the room temperature balance would have been improved in every room with the possible exception of the living room. In this room the unbalanced condition resulted largely from lack of sufficient radiation in the adjoining vestibule, rather than from heat obtained from the chimney.

References

1. Performance of a Hot-Water Heating System in the *I-B-R* Research Home at the University of Illinois, by A. P. Kratz, W. S. Harris, M. K. Fahnestock, and R. J. Martin (*University of Illinois, Engineering Experiment Station Bulletin* No. 349, Section 26).

2. Observed Performance of Some Experimental Chimneys, by R. S. Dill, P. R. Achenbach and J. T. Duck (ASHVE TRANSACTIONS, Vol. 48, 1942, p. 351).

3. Data taken from unpublished progress report on the Performance of Residential Chimneys, by R. B. Engdahl, P. C. Vyff, and F. B. Terrill (May 13, 1946).

4. Investigation of Oil-Fired Forced-Air Furnace Systems in the Research Residence, by A. P. Kratz and S. Konzo (*University of Illinois, Engineering Experiment Station Bulletin* No. 318, pp. 39-44).

5. See Reference 1, pp. 57-62.

See page 140 for Denver Meeting Program

DENVER COMMITTEE ON ARRANGEMENTS

Semi-Annual Meeting

June 29-30, July 1, 1953

Fred Janssen
General Chairman

E. A. Thompson
Vice Chairman

B. H. Spurlock, Jr.
Honorary Chairman

W. R. Egan
Chairman
Banquet

Elmo Hall
Chairman
Sports

H. H. Herman, Chairman
Ladies

J. R. Wilson, Chairman
Entertainment

K. H. Smith, Chairman
Reception

W. V. Burbank
Chairman
Publicity

J. F. Mohan
Chairman
Finance

J. H. McCabe
Chairman
Transportation

F. C. Allen
Chairman
Sessions

Rocky Mountain Chapter Hosts for 1953 Semi-Annual Meeting

General Arrangements Committee for Semi-Annual Meeting
Seated *(l. to r.):* W. R. Egan, chairman, Banquet Committee; K. H. Smith, chairman, Reception Committee; J. F. Mohan, chairman, Finance Committee; A. V. Hutchinson, Executive Secretary; Reg. F. Taylor, President, ASHVE; Fred Janssen, general chairman, Committee on Arrangements; J. H. McCabe, chairman, Transportation Committee. Standing *(l. to r.):* W. V. Burbank, chairman, Publicity Committee; H. H. Herman, chairman, Ladies Committee; Frank C. Allen, chairman, Sessions Committee

DENVER, GATEWAY to the Rockies, and renowned vacation center is, indeed, the ideal locale for the 1953 Semi-Annual Meeting of ASHVE. This fascinating city with its surrounding peaks, invigorating climate and early frontier history offers the Society three exciting days, June 29-30 and July 1, of interesting ASHVE activities combined with vacation fun. Registration will commence June 28, at the Shirley Savoy Hotel.

Prof. B. H. Spurlock, Jr., chairman, Program and Papers Committee, has planned four technical sessions which will be highlighted by the reading of papers on determination of heat and moisture transfer through building materials, cooling tower performance, heat pump design and performance, effect of relative humidity on heat losses of individuals in various temperatures, and heat exchanges in floor panel heated rooms and heat flow analysis in panel heating and cooling sections.

The ladies lend a hand in planning entertainment for Semi-Annual Meeting. *(l. to r.):* Mrs. H. H. Herman, co-chairman, Ladies Committee, Mrs. Reg. F. Taylor, Mrs. N. H. Brickham; Mrs. L. L. Delong, Mrs. A. S. Widdowfield

Officers discuss plans for Semi-Annual Meeting. Standing, *(l. to r.):* A. S. Widdowfield, secretary of Rocky Mountain Chapter, L. L. Delong, treasurer, Sitting *(l. to r.):* B. H. Spurlock, Jr., N. H. Brickham, president of Chapter, Reg. F. Taylor, ASHVE President, A. V. Hutchinson, ASHVE Executive Secretary, and L. H. Wray, program chairman of Chapter

A favorite tourist mecca, Denver is the capital of Colorado and its largest city. This bustling cultural and commercial center of the Rocky Mountain Empire is easy to reach from all directions, and by all means of transportation — six airlines, seven railroads and six major highways.

Colorado is the home of 12 national forests, two national parks and six national monuments, all of which are

PROGRAM — 1953 SEMI-ANNUAL MEETING

The American Society of Heating and Ventilating Engineers
Shirley Savoy Hotel, Denver, Colorado
June 28 to July 1, 1953

Saturday — June 27

10:00 a.m. Finance Committee Meeting
2:00 p.m. Council Meeting

Sunday — June 28

10:00 a.m. REGISTRATION, Shirley Savoy Hotel, (Lincoln Street Annex).
10:00 a.m. Committee Meetings
2:00 p.m. Sightseeing tours of City (Private cars)
4:00 p.m. Chapters Conference Committees

Monday — June 29

9:00 a.m. REGISTRATION, Shirley Savoy Hotel, (Lincoln Street Annex).
9:30 a.m. TECHNICAL SESSION
Call to Order
Performance of a Forced Draft Cooling Tower, by B. H. Spurlock, Jr.
Effect of Relative Humidity on Heat Loss of Men Exposed to Environments of 80, 76 and 72 F, by T. Inouye, F. K. Hick, M. D., S. E. Telser and R. W. Keeton, M. D.
Experimental Approaches to the Study of Noise and Noise Transmission in Piping Systems, by W. L. Rogers
12:00 Noon Welcome Luncheon
1.30 p.m. Golf Tournament — Lakewood Country Club
Research and Eichberg Cups
2:30 p.m. Ladies Style Show and Tea — Park Lane Hotel
1:30 p.m. Children's Entertainment
Outdoor Swimming and City Park Museum of Natural History and Zoo
7:00 p.m. Good-Time Party — (Shirley Savoy Lincoln Room)
Gold Rush Days with Miners, Prospectors, Gamblers, Cowboys and Indians — Dress informal

Tuesday — June 30

9:00 a.m. REGISTRATION, Shirley Savoy Hotel, (Lincoln Street Annex).
9:30 a.m. TECHNICAL SESSION
Electrical Analogger Application to the Heat Pump Process, by C. F. Kayan
Design and Performance of a Residential Heat Pump, by Merl Baker
Moisture Movement in Soils Due to Temperature Difference, by W. A. Hadley and R. Eisenstadt
12:00 Noon Nominating Committee
12:30 p.m. Ladies Theatre Party
Matinee performance of the opera "Carmen" — Central City Opera House. This group will join the others at the Western supper.
2:00 p.m. Mountain Tour and Supper
100 miles of Rocky Mountain scenery ending with a delicious western-style supper with free entertainment at 6:30 p.m.

Wednesday — July 1

9:00 a.m. REGISTRATION
9:30 a.m. TECHNICAL SESSION
Design Data for Slat-Type Sun Shades for Use in Load Estimating, by G. V. Parmelee and D. J. Vild
Automatic Permeance Testing by the Permeometer, by F. A. Joy and A. W. Sherdon
Thermal Performance of Frame Walls, Part II — Air Spaces Blocked at Mid-Height, by G. O. Handegord and N. B. Hutcheon
*Development of Thermal Conductivity Probe, by F. C. Hooper and S. C. Chang
1:30 p.m. TECHNICAL SESSION
Performance of Warm Air Perimeter-Loop and Radial Systems in a Residence, by H. T. Gilkey, R. W. Roose and M. E. Childs
Heat Exchangers in a Floor Panel Heated Room, by L. F. Schutrum, G. V. Parmelee and C. M. Humphreys
Further Studies of Thermal Characteristics of Plaster Panels, by L. F. Schutrum and C. M. Humphreys
*Heat Flow Analysis in Panel Heating or Cooling Sections - Case II: Floor Slab on Earth with Uniformly Spaced Pipes at the Slab-Earth Interface, by H. B. Nottage, C. V. Franks and L. E. Hulbert
1:30 p.m. Ladies Matinee Party
Elitch Garden Summer Theater matinee. Children will also go to Elitch Garden for an afternoon of rides and amusements
7:00 p.m. Semi-Annual Banquet (Shirley Savoy Lincoln Room)
Climax of the meeting. Short program followed by dancing.

*To be presented by title.

easily accessible from Denver. A thrilling experience for the sight-seer is the highest skyline drive in the world, crossing the backbone of the nation, Trail Ridge Road over the Continental Divide in Rocky Mountain National Park. Other scenic spots of unusual interest are: Glenwood Springs, Colorado Springs and Leadwood. The latter is famous for producing more than $120,000,000 of silver in its first 10 years.

Although Denver is most often thought of in terms of great natural beauty, it is also a metropolitan city which sponsors many cultural events. Perhaps the best known of these is the Central City Opera and Drama Festival which opens June 27, and is, therefore, available to the members of the Society. The operas *Carmen* and *The Merry Wives of Windsor*, which will be presented through July 25, are held in Central City, a unique old mining town rich with memories of the past. The Elitch Gardens Summer Theater will also provide a series of plays featuring top-flight actors.

The Rocky Mountain Chapter is eager to show the meaning of the term "western hospitality" to the Society and plans to make the 1953 Semi-Annual Meeting an event long to be remembered. Fred Janssen, general chairman of the Committee on Arrangements, plans a welcome lunch, Monday, June 29, with a Good Time Party scheduled for the evening. The annual golf tournament will also be held June 29, and will feature such awards as the Research Cup, the Eichberg Memorial Trophy and the Paul Bunyan Cup. Two of the outstanding events planned for July 1 include a style show and tea for the ladies and the traditional banquet.

Forms for hotel reservations and special events have been mailed to the members of the Society and they are urged to make their applications for rooms and the special events as soon as possible. Prepare for a good time in colorful Colorado.

Reg. F. Taylor, President of ASHVE, Addresses Eighth Oregon State Air Conditioning Conference

THE EIGHTH Oregon State Air Conditioning Conference, March 18-20, held in Portland, under the auspices of the Oregon Chapter of THE AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS had a record attendance of 200 registrants at the five Technical Sessions. Among the highlights of the three-day meeting was a talk by Society Pres. Reg. F. Taylor, the Conference Banquet and an equipment exhibit sponsored by the Northwest Heating and Air Conditioning Exposition.

The Conference was officially opened on March 18, by K. H. Hanson, president of the Oregon Chapter, who introduced the Honorable Fred L. Peterson, Mayor of the City of Portland. Mayor Peterson welcomed the Society to Portland and stressed ASHVE's service to the public as advisors to City, State and Federal agencies on comfortable air conditions.

B. W. Farnes installs A. N. Hoss *(right)* as newly elected president of Oregon Chapter at its annual meeting banquet at the Multnomah Hotel Rose Bowl, March 20

First Session

The lead off speaker at the first technical session was C. W. Nessell, Minneapolis-Honeywell Regulator Co., Chicago, Ill., introduced by chairman A. N. Hoss. Mr. Nessell spoke on *The Newer Concepts of Forced-Air Heating Systems* and presented data on the efficiency of heating systems. He said that a further advantage is that cooling systems could be installed producing effective results without change in pipe or diffuser sizes.

W. E. Rand, *Stanford Research Institute*, Stanford, Calif., presented a paper on *Practical Means of Abating Air Pollution*. The first portion of his presentation consisted of a movie, *The City That Disappears*, which graphically illustrated the temperature inversions and the type of weather that leads to the frequent occurrence of smog in the metropolitan Los Angeles area. Mr. Rand said the *Stanford Research Institute* is conducting studies to determine the origin of the high ozone concentration which builds up during periods of concentrated smog. He said that this ozone appears to bear a definite relation to eye irritation and other adverse effects of the smog.

Things to Know About Centrifugal Fans was the title of the subject selected by C. O. Fury, Clarage Fan Co., Kalamazoo, Mich. Mr. Fury stated that forced-air systems, using fans, are a necessity in the modern home heated by warm air. Pinpointing his discussion on centrifugal fans for domestic application to those in the volumetric category, he displayed a slide illustrating the three major types of volumetric fans; the forward curved blade wheel, backward curved blade wheel and the straight blade wheel. The presentation was completed by a concise dissertation on *Fan Laws*.

Second (Evening) Session

W. B. Morrison was the chairman of this session, which was open to the general public. *How Shall I Heat My House?* was the topic selected by Walter Hanthorn, consulting engineer, Portland. Mr. Hanthorn stated that many factors must be considered in the design of a domestic heating system. Foremost is the satisfaction of the choice of the owner, who must, however, be assisted in his selection by the evaluation of the advantages, disadvantages, and limitations of the various systems available. He analyzed and compared the available systems in their relative ability to satisfy given standards, and in their inherent limitations.

In the evening, the Northwest Heating and Air Conditioning Exposition was opened for inspection. An outstanding feature was the Oregon Chapter booth which presented the aims and objects of ASHVE. Consultation was given gratis by local consulting engineers on problems in the field of human comfort.

Third Session

Prof. A. D. Hughes, chairman, introduced the first speaker, Prof. W. S. Harris, research professor, University of Illinois, Urbana, Ill. Professor Harris selected *Low Cost Piping* as his subject. He said that present day traditional application of piping to residences is costing

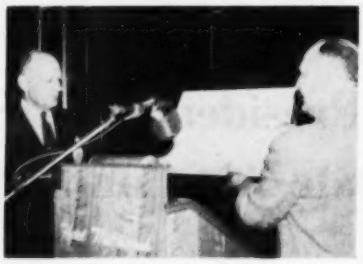
from 30 to 40 percent more than an acceptable simplified system. The reduction of pipe sizes made possible with the advent of forced water circulation has made the newer method of simplified piping possible, Professor Harris stated.

The next speaker, Society Pres. Reg. F. Taylor presented a paper on *Development and Practice of Steam Heating* in which he reviewed the development of steam heating from its younger days to the present time. He also presented a description of radiator development. Mr. Taylor concluded his talk with a brief discussion of ventilation requirements, and stressed the general observation that economy of operation tempts owners and operators to operate ventilating equipment somewhat sparingly, a condition which requires some education.

The third session was terminated with the presentation on *High Temperature Hot Water Heating Systems* by A. J. Hess, Hess, Greiner & Polland, Los Angeles, Calif. Mr. Hess briefly covered the history and advancement of hot water heating systems. He stated that European engineers have progressed further than any others in the use of high-temperature, high-pressure systems, with the successful utilization of pressures as high as 2800 psig. Mr. Hess said that this type of heating system is on the increase, and the delay is due to lack of knowledge on the part of engineers and contractors.

Fourth (Evening) Session

This session was opened to the public. Chairman T. E. Taylor introduced J. Donald Kroeker, consulting engineer, Portland, who spoke on *Air Conditioning in Portland*. Mr. Kroeker discussed at some length the somewhat misleading advertising of *Air Conditioned Oregon*. Confining his discussion to summer air conditioning, he set out to prove the need for summer air conditioning in Portland. The public demand factor is highly psychological, he stressed. As air conditioning becomes more generally installed, it becomes more desirable, and more



J. Donald Kroeker receives scroll, in recognition of his services to the Chapter and to the Society, from B. W. Farnes

in demand by the public. Mr. Kroeker said that the public demand factor is growing fast in Portland.

Fifth Session

F. F. Urban was the chairman of the fifth and final session and introduced the three speakers as follows:

L. G. Miller, Dean of Engineering, Michigan State College, East Lansing, Mich., presented *Chimneys in Theory and Practice*. Dean Miller cited the purpose of chimneys as draft conveyors of the products of combustion to safe discharge areas.

High Pressure Air Systems was the topic selected by Fritz Honerkamp, chief engineer, Anemostat Corporation of America, Hartford, Conn. Mr. Honerkamp discussed the advantages inherent in and the precautions necessary in the use of high velocity air systems. He said that the use of high temperature differentials together with high pressure and high ratio of injected room air, make substantial savings in building and systems costs possible.

Dick Blankenship answering questions at Oregon Chapter booth at Northwest Heating and Air Conditioning Exposition, Portland

Terminating this session T. H. McClung, Portland, presented a paper on *Adaptation of Evaporative Coolers*. Mr. McClung cited the particular areas in the Northwest where the adiabatic cooling obtained with evaporative coolers can be applied and the expected performance for each.

Oregon Chapter Meeting and Banquet

The Eighth Oregon State Air Conditioning Conference was suitably climaxed by a Banquet held March 20, in the Multnomah Hotel Rose Bowl. J. P. McDermott, Trane Co., Portland, was the toastmaster and introduced the banquet speaker, S. D. Peterson, Johnson Service Co., Seattle. J. R. Vernon, Johnson Service Co., Milwaukee, Wis., presented an address on *Public Relations Systems in the Industry*.

There was a review of the year's accomplishments of the Oregon Chapter by the president of the chapter and the installation of 1953-54 officers as follows: *President*—A. N. Hoss; *Vice President*—E. E. Kelly; *Treasurer*—Dick Blankenship; *Secretary*—J. E. Finkbeiner; *Board of Governors*—K. H. Hanson, G. R. Folds, Jr. and W. B. Hayes.

As his first official duty, President Hoss presented a pair of book ends to Ex-President Hanson as a memento of his term of office in the Chapter. He then called B. W. Farnes back to the rostrum to present a scroll to J. Donald Kroeker, commemorating 15 years of service to the local chapter and to the Society.

TRANSACTIONS INDEX COMPLETE 1895 TO 1950

A 20-year Index to TRANSACTIONS (1930-50) has been included in the Society's 1950 TRANSACTIONS.

The Index, which covers the papers presented at the Annual and Semi-Annual Meetings from 1930 to 1950, inclusive, is also available with the 1895-1929 Section, in pamphlet form at a nominal cost, upon request to the Society's headquarters office at 62 Worth St., New York 13, N. Y.

Summary of Chapter Meetings*

TREMENDOUS ENGINEERING POTENTIAL SEEN IN HARNESSING OF SOLAR ENERGY

R. C. Jordan

Pres. M. W. Bishop called the March meeting of the Illinois Chapter to order at the M & M Club in the Merchandise Mart, Chicago. As a token of esteem and appreciation, President Bishop presented a handsome desk set to W. A. Kuechenberg, twice general chairman of the Committee on Arrangements for Annual Meetings of the Society.

Guest speaker, Dr. R. C. Jordan, head of the Department of Mechanical Engineering at the University of Minnesota, gave an extremely interesting lecture on the wide use of solar energy for heating. In his paper entitled, *Solar Energy and Its Engineering Potentialities*, Dr. Jordan informed the Chapter that the future will bring many applications of the harnessing of solar energy. He stressed the ratio of available solar energy to available natural combustibles with a striking illustration. He said that if all of our natural combustibles such as wood, coal, etc., were burned, they would replace the sun for only three days, and if all future atomic power were converted into energy, it would last for one additional hour. Dr. Jordan also used slides to show that enough solar energy is available in a relatively small portion of the southwest part of this country to take care of the energy needs of the nation.

The Board of Tellers listed the nominating committee as follows: G. W. Bornquist, G. V. Zintel, M. W. Bishop, E. P. Heckel, Jr., M. J. Bamond, H. G. Chapin and Harry Gragg. Attendance 102. Attendance ratio 0.21.

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• *ARKANSAS:* The March meeting was called to order by Pres. H. Cumnock at the Sam Peck Hotel. A letter was received and read from the Rocky Mountain Chapter inviting the Arkansas Chapter to attend the Society's Semi-Annual Meeting to be held in Denver. J. L. Brown introduced the speaker of the evening, C. W. Lockhart, assistant sales manager of Buffalo Forge Co. His subject was *Fans as Used in Heating, Ventilating and Air Conditioning.* He pointed out the four general types of fans with a discussion of each type. A question and answer period followed. Attendance 25. Attendance ratio 0.34.

• *ARKANSAS:* The February meeting was called to order by newly elected Pres. H. Cumnock.

The speaker for the evening, F. J. Nunlist, Jr., general sales manager, L. J. Mueller Furnace Co., was introduced by J. L. Brown. Mr. Nunlist selected as his topic *What is New in Residential Heating and Cooling.* He stressed the fact that many of the experiments conducted by the Society in the field of comfort are of valuable assistance to manufacturers. Attendance 33. Attendance ratio 0.47.

• *BALTIMORE:* The March meeting was called to order by Pres. E. R. Kent at the Engineers Club of Baltimore. The speaker of the evening, introduced by H. D. Glaser, was J. E. Hibline of the J. E. Hibline Co., who spoke on the subject, *Coal in Tomorrow's World.* Mr. Hibline gave comparative figures which indicated that the majority of the known recoverable fuel reserve in the United States is coal. There is an increased preference for all types of liquid fuels and a decline in the amount of coal consumed by railroads and home heating. This will put a burden on the petroleum industry which will eventually fall on the coal industry. The known natural gas deposits are estimated as good for about 20 years reserve. Oil is being consumed at a rate of 1,000,000 barrels a day, more than is produced in this country. Mr. Hibline concluded by stating that the future economy of our country is going to be with the coal industry for a long time. Attendance 29. Attendance ratio 0.28.

• *BRITISH COLUMBIA:* Pres. M. E. Minaker called the March meeting to order at the Quadra Club in Vancouver. After the business at hand was completed, President Minaker introduced Reg. F. Taylor, newly elected president of the Society and consulting engineer, Houston, Tex. Mr. Taylor's speech traced the progress of the 58 years of the Society's existence from its original 75 charter members in 1895 to its 1953 registration of over 8500. Attendance 47.

• *BRITISH COLUMBIA:* The February meeting was held at the Quadra Club and was called to order by M.

*Note: The attendance ratios shown represent the membership attendance divided by the chapter membership. These ratios will be useful as a partial indication of interest shown by local chapter members in various types of subjects programmed by the various chapters and may be useful in deciding on subjects for chapter meetings.

E. Minaker, Chapter President. Among the guests present were 35 students and faculty members of the Department of Mechanical Engineering at the University of British Columbia.

Mr. Minaker reported that 12 members of the Chapter attended the 59th Annual Meeting in Chicago which is a large percentage for a new chapter.

S. D. Peterson introduced the speaker of the evening, J. Donald Kroeker, consulting engineer, Portland, Ore. Mr. Kroeker delivered a most informative talk on *ASHVE and its Place in the Heating and Ventilating Industry.*

Deep sorrow was felt by all the members present who stood silent for a minute when the death of Honorary President Walter Leek, Society Life Member, was announced. Attendance 78.

• *BRITISH COLUMBIA:* A Special Events Committee was set up at the January meeting with J. M. Bird as head of it. The other members on the committee are: A. C. Martin, R. D. Hale and Cornelius Van Boeyen.

C. W. Leek introduced the guest speaker, D. W. Thomson, chapter secretary and consulting mechanical engineer, West Vancouver, B.C. *The Role of the Consulting Engineer* was the title of Mr. Thomson's speech. At the conclusion of the talk, a movie was shown by Mr. Van Boeyen. Attendance 47.

• *CENTRAL NEW YORK:* Pres. F. J. Krell opened the February meeting at the Bellevue Country Club. There was a discussion on the March meeting and it was decided that the subject of residence heating and cooling would be preferred to the subject of residence heating alone. Noble Hurst of the Carrier Corp. introduced the speaker of the evening, Jean F. Gechwind, who spoke interestingly on the subject of *The Features of High Pressure Hot Water Heating Systems.* Attendance 27.

• *CENTRAL OHIO:* The March meeting was called to order at the Fort Hayes Hotel, by Pres. A. D. Bogen. The president appointed three past presidents, R. S. Curl, H. G. Hays, and E. A. Norman, Jr., to serve on the nominating committee. C. B. Cornell of the City of Columbus spoke on *The Water Situation in Regard to the City of Columbus.* Attendance 26. Attendance ratio 0.26.

• *CONNECTICUT:* Pres. T. L. Arnold called the March meeting to order at the Three Cups Inn, Meriden. He then introduced the speaker of the evening, R. E. Holmes, chief engineer of the Air Conditioning and Refrigeration Div. of Worthington Pump & Machinery Corp., Holyoke, Mass., who gave an interesting talk on *Ventilation of Atomic Energy Laboratories.* Attendance 38.

• *CONNECTICUT:* C. J. Wahnquist, Jr., reporting for the membership committee, stated that three new members have been added to the Connecticut Chapter — J. J. De Mino, Peter Flagg and Fritz Honerkamp.

Pres. T. L. Arnold spoke on Engineers Week and as the alternate on the Chapters Conference Committee, gave a report on the Annual Meeting held in Chicago.

The aim of the Connecticut Chapter was also discussed. It was suggested that the members who are engineers might be persuaded to serve on Society committees with the idea of finally becoming a Society officer.

The speaker for the February meeting was J. D. Pierce, chief engineer, The Vulcan Radiator Co., Hartford, who spoke on *Application of Fin Tube Radiation.* Attendance 62.

• *EMPIRE STATE CAPITAL:* F. A. Weinbender, chairman of the nominating committee, submitted a slate of officer-candidates for the coming year. The following members were chosen: *President*—N. W. Burrill; *First Vice President*—G. G. Davis; *Second Vice President*—E. C. Doyle; *Secretary-Treasurer*—L. V. Appleby; *Board of Governors*—E. J. Mahoney, H. F. Kruger and F. R. Foote.

Prof. A. G. Schubert was in charge of the evening's program which consisted of talks by three students from Rensselaer Polytechnic Institute. Donald Steels' topic was *A Self-Contained Portable Space Heater for Tent Heating;* Frank Satan's subject was *Development of a Fluid Magnetic Brake* and the title of Albert Krances' talk was *Arithmetic in Engineering Problems.*

The March dinner meeting was called to order by Pres. Harry Horowitz. Attendance 31.

• *GOLDEN GATE:* Pres. T. J. White called the March meeting to order at the Engineers Club. M. Simonson spoke on the activities of the *California Legislative Council of Professional Engineers* as they relate to proposed legislation affecting engineers and commented on the necessity for the engineering profession to watch this proposed legislation and know what is going on. He suggested participating actively and financially in aiding the group that is looking out for the engineers' interests. A discussion followed, culminating with a motion by C. H. Bazille as follows: move that the Golden Gate Chapter make available $5.00 per year to the Chairman of the Legislative Committee of the Golden Gate Chapter to become a member of the *California Legislative Council of Professional Engineers.* Following this discussion, the 1956 Annual Meeting was commented upon and it was decided to extend an official invitation to the Society to hold the meeting in San Francisco in 1956.

The meeting was then turned over to J. E. Murray, who introduced Reg. F. Taylor, president of the ASHVE and consulting engineer, Houston, Tex. Mr. Taylor presented a very interesting paper covering some of the history of the Society. Attendance 52.

• *INLAND EMPIRE:* The March meeting was called to order by Pres. T. P. Nau in the Stone Room of the

Spokane Hotel. President Nau made a brief account of the plan discussed during this month's board meeting for Pres. Reg. F. Taylor's visit. Ralph Nelson, Jr., then introduced C. A. Pickett, manager of the Pacific Division, Herman Nelson Division, American Air Filter Co., Chicago, Ill. Mr. Pickett gave an interesting talk describing a heating experiment conducted at the George Washington School in Moline, Ill. Mr. Pickett's address was supplemented by colored slides showing graphs, charts and photographs of the testing apparatus used. A lively question period followed. Attendance 19.

• *KANSAS CITY:* Pres. W. A. Reichow called the March meeting to order at the Wishbone Restaurant. Members of the *American Society of Refrigerating Engineers* were guests of the Chapter for this meeting. J. R. Vernon, vice president and sales promotion manager, Johnson Service Co., Milwaukee, Wis., was the principal speaker of the evening. Mr. Vernon, who has been president of both the Illinois and Wisconsin Chapters of the ASHVE, gave an extremely interesting talk on recent developments in temperature control, illustrated with slides. Attendance 75.

• *KANSAS CITY:* The February meeting was called to order at the Wishbone Restaurant by Pres. W. A. Reichow. Vice Pres. G. H. Stoffer introduced the speakers of the evening who were all past presidents of the Kansas City Chapter, each speaking on his experiences and reminiscences of heating and ventilating work, and the past history of the Chapter. The speakers included Gustav Nottberg, C. A. Weiss, and E. K. Campbell. Attendance 65.

• *MANITOBA:* The March meeting was called to order at the Fort Garry Hotel by Pres. W. J. Atkinson. C. M. Fleming introduced the guest speaker, D. B. Thomas, manager of the Air Conditioning Division of the Canadian General Electric Co. of Toronto. Mr. Thomas spoke on *Year Round Residential and Commercial Air Conditioning.* His talk was well illustrated by slides and was most interesting to all the members. Attendance 39.

• *MASSACHUSETTS:* The February meeting was held at the Faculty Club of M. I. T. In place of the usual coffee speaker, a film was presented on how to use the telephone, by courtesy of the New England Telephone and Telegraph Co. E. Kirkpatrick of the Farr Co., Inc. was the principal speaker of the evening. His subject was devoted to the new methods of rating and testing air filters. He described the nature of dust, lint and smoke and classified the types of filters for coping with such nuisances. He also submitted the opinion that a test method should be such that it would enable the user to predict results under actual conditions, describing sampling methods and test methods to achieve this end. A lively discussion period followed. Attendance 44.

• *MIAMI VALLEY:* Pres. D. L. Bergman called the February meeting to order at Benham's in Dayton. J. M. Schweiger introduced Merl Baker, professor of mechanical engineering, University of Kentucky, Lexington, Ky., whose subject was the study of radiant heating and cooling. A brief history of radiant heating was followed by engineering data and basic design facts as derived from extensive research and field tests. Professor Baker's presentation stimulated the lively question and answer period which followed his address. Attendance 37. Attendance 0.57.

• *MIAMI VALLEY:* The January meeting was called to order by Pres. D. L. Bergman following dinner at Annarino's in Dayton, Ohio. J. B. Rishel presented a paper giving a thumb nail sketch of just what ASHVE is, who comprises its membership, qualifications for membership, and an outline of local chapter activities and purposes. The meeting was then turned over to J. M. Schweiger, who introduced the speaker of the evening, William Killian of the Herman Nelson Div., American Air Filter Co., who presented the results of tests which point the way to a more scientific evaluation of comfort conditions and building performance. Mr. Killian also displayed temperature records which showed the need for winter cooling and room by room control. Attendance 29.

• *MICHIGAN:* The March meeting was called to order in the quarters of the Engineering Society of Detroit and was presided over by Pres. C. A. Strand. Vice Pres. R. H. Oberschulte introduced the speaker of the evening, R. A. Gonzalez, chief application engineer, Airtemp Div., Chrysler Corp., who spoke on the subject of residential air conditioning, outlining the features which appeal to owners and builders. Mr. Gonzalez pointed out that fine calculations are unnecessary since cooling units are available only in standard sizes such as 2, 3, and 5 hp and that load calculations consist of making a selection of one of the sizes available. Insofar as trends for the future are concerned, Mr. Gonzalez stated that, although there is a tendency toward the use of air cooled condensers, water cooled condensers are preferable in locations where water is available at a reasonable rate. He indicated that too much automatic control leads to complications and expressed the opinion that eventually control systems would become greatly simplified. It was also the opinion of Mr. Gonzalez that residential air conditioning is still in the formative stage. Attendance 134.

• *MICHIGAN:* Pres. C. A. Strand called the February meeting to order at the Engineering Society's quarters in Detroit. The speaker of the evening was introduced by Vice Pres. R. H. Oberschulte. The speaker was Henry Wright, technical consultant of the Herman Nelson Div., American Air Filter Co., Moline, Ill. His very

absorbing talk was devoted to the do's and don'ts for heating and ventilating school buildings. Mr. Wright reported on the results of research conducted in a school building in Moline, Ill. The results of this research indicated that cooling is needed most of the time in school buildings due to the solar heat gain resulting from the extensive glass areas used in modern school buildings and the heavy occupancy in them. He also stated that tests proved that students work and learn more rapidly under proper temperature conditions. A great deal of interest on the part of the listeners was indicated during the question and answer period. Attendance 120.

• *MINNESOTA:* Pres. William Sturm called the March meeting to order in the Robin Hood Room of the Dyckman Hotel. He announced that T. H. Smoot had been nominated as the regional member on the Society's Nominating Committee. Mr. Smoot is director of Engineering Research for the Lennox Furnace Co. President Sturm then introduced the speaker, J. S. Locke, Commercial Division, Minneapolis-Honeywell Regulator Co., Minneapolis, Minn., who gave a stimulating talk on a field study of floor panel systems. Attendance 81.

• *MONTREAL:* Pres. W. G. Hole called the March meeting to order at the Berkeley Hotel. He announced a joint meeting with the *Engineering Institute of Canada* on March 31 at their headquarters. S. R. Plamondon introduced the speaker of the evening, Prof. C. P. Yaglou, Industrial Hygiene, Harvard School of Public Health, Boston, whose talk was devoted to the habitability studies in Arctic shelters. Professor Yaglou's talk was illustrated with slides and ably described conditions noted in standard camp shelters in extreme Arctic conditions. Attendance 54.

• *NEBRASKA:* The March meeting was called to order by Pres. S. W. Black in the Ball Room of the Castle Hotel, Omaha. The president introduced the speaker of the evening, W. L. Shomaker, vice president of the Northern Natural Gas Co. His talk was devoted to the natural gas industry and also covered a very enlightening subject relative to the technical problems of this fast expanding utility. He presented maps of future plans and outlined the probable future of natural gas in the Nebraska area. Attendance 40. Attendance ratio 0.69.

• *NEBRASKA:* Pres. S. W. Black called the February meeting to order in the Omaha Room of the Castle Hotel. R. D. Anderson introduced the guest speaker, John Cable of the Allis-Chalmers Mfg. Co., who presented a color motion picture entitled *Theory of Centrifugal Pumps.* He then showed slides and graphs relative to pump selection and concluded with a discussion including questions and answers on this topic. Attendance 37.

• *NEW YORK:* The March meeting was called to order by Pres. P. B. Gordon at the Building Trades Club in New York City. J. E. Schechter introduced the guest speaker, S. Konzo, research professor of mechanical engineering, University of Illinois, Urbana, who gave a talk on *Trends in Warm Air Heating,* of which he discussed five phases. He also described the development of floor duct systems to obtain a heated slab floor, stating that such systems were too costly due to the many small ducts required in the floor. Following this long and stimulating dissertation, the speaker answered questions for a considerable length of time. Attendance 110. Attendance ratio 0.18.

• *NORTH JERSEY:* Pres. F. H. Faust called the March meeting to order. H. M. Patrick then introduced the speaker, Henry Wright, technical consultant, Herman Nelson Div., American Air Filter Co., Moline, Ill. who gave a talk on heating research at the Laboratory School. This talk dealt with the wide variations in heating that occur in school classrooms as a result of the influence of mechanical ventilation and solar effect. Much discussion followed this extremely absorbing talk. Attendance 100.

• *NORTH TEXAS:* The February meeting was held at the Melrose Hotel and was called to order by Vice Pres. M. W. Brown. Members and guests introduced themselves. E. T. Keck, program chairman, then introduced J. P. Wilson of A. M. Lockett Co., Dallas, who presented a sound film *Steam for Power.* A short question period followed.

J. R. Dowdell and G. H. Meffert presented ideas as to how prospective members could be sponsored by Chapter members. Mr. Brown referred the question to the attendance committee for study, the decision to be reported at the next meeting. Ross Zumwalt asked that if anyone had any ideas on equipment suitable for the SMU steam generating plant to get in touch with him as quickly as possible. Attendance 96. Attendance ratio 0.52.

• *NORTHERN OHIO:* Pres. R. E. Sherman introduced the guest speaker, Douglas Leffingwell, whose subject was *Income Tax Returns.* Mr. Leffingwell presented some interesting data on the tax increase of those in the lower income bracket. He also cited a typical case of a married man filing a joint return for the years 1940 and 1952.

The remainder of the evening's program at the February meeting consisted of a panel discussion on *Automatic Temperature Control* with R. L. Byers serving as moderator. The chapter members who participated in the discussion were: R. J. Hoefer, who defined the terms commonly used in automatic control terminology; L. C. Burkes' topic dealt primarily with the application of controls to a hot and cold duct air conditioning system, and R. D. Wilson discussed the advantages, disadvantages and operating characteristics of a number of control

systems using air and water as the controlled medium. Attendance 63.

• *ONTARIO:* Pres. J. H. Ross called the March meeting to order at the Royal York Hotel. The guest speaker was H. A. Belyea, industrial hygiene engineer, Ontario Department of Health. He delivered a talk on the evaluation and control of toxic airborne contaminant in the working environment. Mr. Belyea's lecture was very enlightening, and was followed by a lively discussion period. Attendance 93. Attendance ratio 0.35.

• *OREGON:* The March meeting was called to order in the Heathman Hotel by Pres. K. H. Hanson. A. N. Hoss introduced the guest speaker, E. R. Lokey. The program consisted of the entire committee that has been working on the 8th Oregon State Air Conditioning Conference and Exposition group, giving a complete resume of just what is going to happen at this Conference. Mr. Lokey stated that there was certainly a great deal of enthusiasm as usual for this very important function of the Chapter year and the success of the Conference seemed assured. Attendance 70. Attendance ratio 0.38.

• *OTTAWA VALLEY:* At the February meeting, held in the Prescott Hotel, D. W. Banton introduced the guest speaker, F. A. Joy, associate professor of Engineering and Research at The Pennsylvania State College, State College, Pa. Professor Joy, previously associated with both the General Electric Co. and the Public Service Co. of New Hampshire, discussed his work with water vapor migration and condensation in construction.

The speaker stressed the fact that extensive studies have been conducted to determine the effect of vapor barriers and vapor pressure deterioration, but that corrections must be found to help existing walls from condensation. He also said that another factor requiring research is the amount of ventilation required within a wall. Attendance 26.

• *PHILADELPHIA:* It was reported at the February meeting that the following are new members of the Philadelphia Chapter: R. L. Bitzer, R. M. Gillett, H. V. Mount, Jr. and S. H. Manheimer.

Pres. M. E. Barnard spoke about the Annual Meeting of ASHVE. After his report, nomination of officers, for the 1953-1954 term, took place. The candidates are: *President* — C. F. Dietz; *First Vice President* — L. M. Church; *Second Vice President* — A. M. Robertson; *Treasurer* — C. J. Lubking; *Secretary* — P. H. Yeomans. C. J. Forve was nominated as a member of the board of governors in addition to the officers mentioned. Attendance 62.

• *PITTSBURGH:* Pres. B. B. Reilly opened the March meeting at Webster Hall. C. H. Schneider introduced the speaker of the evening, L. G. Miller, dean of the School of Engineering, Michigan State College, East Lansing, Mich. Dean Miller devoted his talk to chimneys in theory and practice. It was his opinion that chimneys should be able to produce draft and should also be able to conduct the products of combustion out to the atmosphere. Dean Miller illustrated his remarks with a few slides on the design of chimney sizes. After his most interesting talk, many questions were asked, which the speaker answered to the satisfaction of all. Attendance 41.

• *ROCKY MOUNTAIN:* At the February meeting, Council member B. H. Spurlock, Jr., announced that the Society is seeking 1000 new members this year. He also reported that 1620 members had registered at the Society's Annual Meeting held in Chicago.

Shortly after the call to order, the meeting was recessed and the members proceeded to the *Opportunity School* for an informative and interesting evening. "Vince" Johnson, who is associated with this school, spoke on the course of instruction given to all custodians of Denver Public Schools. His talk emphasized the increasing demand for skill and training on the part of the custodian as a result of the greater use of mechanical and electrical equipment in modern schools. Attendance 27.

• *SACRAMENTO VALLEY:* The March meeting was held at the Capitol Inn's Ship Room and was called to order by Pres. L. A. O'Meara. E. C. McKinsey then introduced the speaker of the evening, the Society's president, Reg. F. Taylor, consulting engineer, Houston, Tex. Mr. Taylor reviewed the Society's growth and aims from its inception to the present time. He also expressed the expectation that there would be an increase in the use of air conditioning in homes due to reduced equipment costs and possible reduced energy costs through the use of atomic power. Attendance 53. Attendance ratio 0.54.

• *SHREVEPORT:* Guest speaker F. J. Nunlist, Jr., general sales manager, L. J. Mueller Furnace Co., Milwaukee, Wis., spoke on *Heating and Cooling of Residences.* His talk was followed by an interesting question and answer period.

Vice Pres. M. A. Hudson reported on the Annual Meeting in Chicago. He stressed the point that certain activities and actions are required by Society affiliations. The February meeting was called to order by Pres. W. S. Evans. Treasurer R. S. Segall gave a report on current funds. Attendance 41. Attendance ratio 0.61.

• *SOUTH TEXAS:* A highlight of the February meeting was the appearance of Society president, Reg. F. Taylor, who spoke about the Annual Meeting held in Chicago and the Society plans for the coming year.

A panel discussion with B. J. Beaird as moderator followed. Five speakers took part in a discussion on *Cooling Towers.* They were: C. A.

Myers, who spoke on atmospheric cooling towers; R. O. Ayres, whose topic was use of red wood in building cooling towers; J. T. McKinley spoke on cooling tower hardware and accessories; J. Cunningham talked about cooling water in general; and N. Laubach chose the growth of the cooling tower industry as his subject.

A. B. Ullrich, Jr., advised the members that additional mementos could still be put in President Taylor's *Book of Letters*. Attendance 73.

• *SOUTHERN CALIFORNIA:* W. J. Biggar introduced the principal speaker of the evening, E. V. Agafonoff, Aladdin Heating Corp., Oakland, Calif., whose subject was *Centrifugal Fans*. Mr. Agafonoff traced the early history of fans from the simple wooden paddle which originated in the 17th century, through the 19th century when the scroll was added, and finally to the 20th century when multi-blade or squirrel cage types of fans were invented. These types are typical of the centrifugal fans of today. They may have forward curved, backward curved and radial blades. He also stated that the Society and *NAFM* had jointly established recognized standards for testing fans used by the industry.

Pres. J. S. Earhart reported on the Chapters Conference Committee meeting held in Chicago. He also recounted his findings at the 11th International Heating and Ventilating Exposition, concluding that the main trend was toward package air conditioners.

A nominating committee was elected at the February meeting with W. O. Stewart as chairman. Attendance 86.

• *SOUTHERN CALIFORNIA:* The January meeting, held at the Carolina Pines Restaurant, was called to order by Pres. J. S. Earhart.

Guest speaker Howard Grundfor, assistant branch manager, Barber-Colman Co., gave an interesting talk on *Air Distribution*. The presentation was illustrated with slides. Attendance 72.

• *SOUTHERN PIEDMONT:* At the February meeting, the following officers were unanimously elected: *President* — R. E. Mason; *Vice President* — R. S. Fullerton; *Secretary* — S. B. Blanton; *Treasurer* — W. E. Stowe, Jr.; *Board of Governors:* R. M. Warren, Jr., C. N. Witmer and W. P. Wells.

W. Wortman, Duke Power Co., guest speaker, was introduced by Pres. R. M. Warren, Jr. Mr. Wortman's topic, *Telemetering and Power Distribution*, covered many fine points on electricity and its distribution problems.

Membership chairman F. L. Lawrence reported that the Southern Piedmont Chapter had 67 actual members with two applications still pending before the Council.

President Warren called the meeting to order at Thackers Restaurant. Attendance 20.

• *SOUTHWEST TEXAS:* Pres. D. E. Locher called the March meeting to order at the Hitchin' Post in Austin. L. H. Hornor, Jr. introduced the speaker, A. B. Newton, product director of Acme Industries, Inc., Jackson, Mich. Mr. Newton indicated that there had been a number of increases in chilled water applications over the past three or four years. The increase was attributed to the flexibility of chilled water systems and the introduction of small self-contained systems. Mr. Newton's lecture dealt with real and imaginary problems of control of these systems, such as protection against short cycling, assurance of recycling, maintenance of fully active heat transfer surfaces and freeze up protection. An interesting round table discussion followed Mr. Newton's talk. Attendance 34. Attendance ratio 0.29.

• *UTAH:* This meeting, held on March 19, consisted of a conducted tour through the Geneva Steel Plant at Geneva, Utah. Mr. Arrington of the Geneva Co. guided the tour through the entire plant. The company had another one of its members explain the workings of the plant and questions were answered to the satisfaction of all concerned.

Pres. D. R. Wilde injected only one phase of business and that was the presentation of a past president's pin to A. R. Curtis, which all felt he richly deserved. Attendance 28.

• *UTAH:* The February meeting was called to order by Pres. D. R. Wilde at the Hotel Newhouse. The guest speakers of the evening were E. J. Alter and Ted Browne, who were introduced by Edward Baker. They spoke on the subject of heat pumps. A very interesting illustrated lecture was presented by Mr. Alter and was followed by a detailed talk on the heat pump by Mr. Browne. It was pointed out by each speaker that it was essential that both heating and cooling be considered thoroughly, and if these factors were not considered, the initial investment in heat pumps would still be somewhat in excess of the present heating equipment. From the lecture of these two capable men it was determined that with the coming of package units in the marketing of heat pumps, the heat pump would be coming to the fore and taking its rightful place in the heating and ventilating picture of modern homes. Attendance 25.

• *VIRGINIA:* The March meeting was called to order by Pres. E. D. Duval in the auditorium of R. F. Trant, Inc., in Norfolk. Since no speaker was available for this meeting, J. E. White suggested that for future meetings a local stand-by speaker or a film be available. Attendance 13. Attendance ratio 0.28.

• *VIRGINIA:* J. D. Pierce, chief engineer, The Vulcan Radiator Co., Hartford, Conn., speaker of the evening, chose as his topic *Wet Heat Can Compete*. After his informative talk, a lively discussion period followed.

Pres. E. D. Duval called the February meeting to order at the Nansemond Hotel. Attendance 82. Attendance ratio 0.31.

• *WESTERN MICHIGAN:* The March meeting was held at the Kellogg Center, Michigan State College, East Lansing. C. F. Kroshel, service representative of Bachrach Industrial Instrument Co., was guest speaker of the evening. He presented a most interesting talk on combustion instruments, illustrated with slides. Attendance 85. Attendance ratio 0.54.

STUDENT BRANCH

• *UNIVERSITY OF DETROIT:* Pres. T. J. Feaheny, Jr., called the February meeting to order in the Engineering Building of the University.

The speaker for the evening was G. D. Winans, assistant general superintendent of the Central Heating Division, The Detroit Edison Co., Detroit, Mich. Mr. Winans described the many different experiments and installations that have been tried in Detroit concerning the use of steam in keeping sidewalks clear of ice and snow. He also discussed the lack of instrumentation and general working knowledge which prevent the widespread use of the systems now in use in Chicago. Attendance 15. Attendance ratio 0.54.

Candidates for Membership

The Society's By-Laws require that all applications for membership or advancement are to be sent to the Executive Secretary and the names of applicants and their references shall be printed in the next issue of the JOURNAL of the Society, or mailed to all members. When the replies are received from references the Candidate's application shall be submitted to and acted upon by the Admission and Advancement Committee as soon as possible.

When the Admission and Advancement Committee has acted favorably upon a Candidate's application and assigned his grade, the Council shall confirm the election of the proposed Candidate for membership. During the past month there have been 157 applications for membership, including 37 student applications and 1 reinstatement; in addition 11 advancements have been received. The names of these men and their sponsors are published in the following list.

Members are requested to scrutinize the list with care. The Admission and Advancement Committee, and in turn, the Council, urge members to assume their share of responsibility of receiving these candidates into membership by advising the Executive Secretary promptly of any whose eligibility for membership is in any way questioned.

All correspondence in regard to such matters is strictly confidential, and is solely for the good of the Society, which it is the duty of every member to promote.

Unless objection is made by some member by May 29, 1953, these candidates will be voted upon by the Council. Those elected to membership will be notified by the Executive Secretary immediately after election.

Note: †Reinstatement. *Non-member. △Advancement.

California

EDMONDSON, J. P., Engr., Jackson & Blanc, San Diego. REFERENCES: J. M. Fleisher*, M. S. Jackson*, B. E. Rued*, J. G. Siler, III.

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JERDE, J. C., Supt. Sheet Metal, H. K. Ferguson Construction Co., Sacramento. REFERENCES: D. L. Clark, Fritz Reichel*, G. W. Wagner*, Ernie Weber*.

KODMUR, MELVIN, Mech. Designer, E.L.E. Co., Los Angeles. REFERENCES: A. H. Downes, Robson English, M. J. Kodmur, J. L. McCullough.

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Brickham, J. J. Johnson, H. W. Marshall, J. H. McCabe.

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Oregon

INGHAM, C. F., Engr., Brod & McClung, Portland. REFERENCES: Dick Blankenship, W. B. Hayes, T. H. McClung, L. F. Miller.

△JACOBSON, O. T., Engr., The Trane Co., Portland. REFERENCES: R. C. Chewning, J. P. McDermott, K. R. Murhard, T. E. Taylor.

Pennsylvania

MCMICHAEL, W. C., Mgr., Air Conditioning Dept., Bryant Air Conditioning Corp., Philadelphia. REFERENCES: J. R. Ellstrom, R. M. Gillett, Mortimer Traugott, C. H. Wilson*.

RAMP, E. G., Repr., American Blower Corp., Philadelphia. REFERENCES: E. I. Curley, John Everetts, Jr., H. B. Hedges, H. B. Prewitt.

ROUSHEY, R. E., Partner, Roushey & Smith, Engrs. & Consultants, Wilkes-Barre. REFERENCES: C. L. Bowman, R. C. Johnson, D. B. MacDonald, C. M. Merrick*.

Rhode Island

MILOT, ARTHUR, Engr., Lagace Service Oil Co., Woonsocket. REFERENCES: V. O. Dauray*, C. H. Dow, L. C. Mandell, M. V. Tucker*.

Tennessee

JASON, W. J., Engr., Air Temperature, Inc., Memphis. REFERENCES: A. T. Bevil, W. L. Drake, M. H. Ellis, Jr., Allan Howit.

VADEN, LEONARD, Htg. & Air Cond. Supvsr., Clarksville Base, Clarksville. REFERENCES: Randall Burchett*, W. A. Byars, Jr., McKay King*, J. H. Taylor*.

Texas

ARTERBURN, C. B., Dist. Repr., American Air Filter Co., Houston. REFERENCES: J. T. Davis, D. S. Freese, H. J. Noles, V. F. Self.

AVERY, R. J., JR., Engr., M. B. Kiser Htg. & Air Cond. Contr., Dallas. REFERENCES: J. P. Ashcraft, A. F. Avera, I. I. Bock, J. R. Dowdell.

LEFTWICH, L. C., JR., Engr., A. M. Lockett & Co., Ltd., Dallas. REFERENCES: W. E. Frost, E. T. Gessell, E. T. Keck, Jr., H. A. Loughborough.

MARKEY, W. F., Engr., American Blower Corp., Dallas. REFERENCES: J. A. Bishop, M. W. Brown, H. H. Hill, H. J. Templeton.

†SULLIVAN, DALLAS, Mgr., Johnson Service Co., Houston. REFERENCES: A. I. Brown, R. S. Curl, P. D. Gayman, R. J. Salinger.

Virginia

BAKER, I. M., JR., Owner, Baker & Co., Norfolk. REFERENCES: R. L. Burton, Jr., C. G. Conaway, E. D. Duval, H. E. Marquart.

CRUMPLER, J. R., Field Supvsr., Virginia Sheet Metal & Roofing Co., Norfolk. REFERENCES: T. B. Carpenter, C. G. Conaway, E. D. Duval, F. R. Ervin.

MILLER, A. B., Engr., Minneapolis-Honeywell Regulator Co., Norfolk. REFERENCES: C. G. Conaway, D. C. Delinger, E. D. Duval, F. R. Ervin.

WETHERINGTON, ROY, JR., Draftsman, Virginia Sheet Metal & Roofing Co., Norfolk. REFERENCES: T. B. Carpenter, C. G. Conaway, D. C. Delinger, E. D. Duval.

Washington

HEINO, A. R., JR., Mech. Engr., James B. Notkin, Mech. Engr., Seattle. REFERENCES: H. T. Griffith, B. S. Notkin, J. B. Notkin, P. E. Tietje.

M. W. Bishop, president of Illinois Chapter, presenting desk set to W. A. Kuechenberg

W. A. KUECHENBERG RECEIVES AWARD

W. A. Kuechenberg, president of R. B. Hayward Co., Chicago sheet metal contracting firm, was recently given an award by the Illinois Chapter of ASHVE in appreciation for his services as chairman of the Committee on Arrangements for the 55th and 59th Annual Meetings of the Society, held in Chicago during 1949 and 1953. Presentation of a pen and pencil desk set was made by Chapter President, M. W. Bishop at the Chapter's March meeting.

Mr. Kuechenberg is well known in the sheet metal field and is active in a number of local and national associations. He is currently a director of the *Sheet Metal Contractors National Association.*

OZANNE, F. S., Engr., R. E. Chase & Co., Seattle. REFERENCES: R. E. Chase, F. C. De Shaw, J. B. Notkin, W. B. Pride.

STILLWELL, S. R., Owner, Stillwell Heating, Spokane. REFERENCES: G. M. Dieter, J. G. Gookstetter, J. L. Harvey, Bob Nevers*.

WELLS, R. D., Draftsman, De Witt C. Griffin & A. K. Stillman, Seattle. REFERENCES: D. C. Griffin, J. A. MacDonald, D. F. Owens, W. C. Vradenburg.

West Virginia

HAMMANN, P. E., Engr., The Trane Co., Clarksburg. REFERENCES: H. M. Cather*, R. P. Dickinson, Jr., E. J. Kelly, R. C. Tonry.

Wisconsin

JOHNSON, R. L., Owner, Johnson Sheet Metal Works, Sparta. REFERENCES: L. W. Bren, R. H. Lee, D. R. Lindgren, R. H. Lindgren.

Canada

ALMOND, NOEL, Repr., Engineering Industries Co. Ltd., Toronto. REFERENCES: R. F. Davenport, H. S. Moore, A. W. Rae, C. D. Seymour.

BARRETT, M. J., Repr., Iron Fireman Mfg. Co. Ltd., Toronto. REFERENCES: D. H. Butler, G. P. Cooper, H. S. Moore, L. C. West.

CAMPBELL, LESLIE, Repr., Howard Furnace & Foundries, Toronto. REFERENCES: A. M. Clark, L. K. Hughes, Jim Reath*, H. R. Roth.

DARLING, G. E., Repr., Waterous Ltd., Brantford, Mimico. REFERENCES: G. A. English, G. H. Hopper, William Philip, J. H. Ross.

FODOR, NICHOLAS, Cons. Engr., Toronto. REFERENCES: Robert Kerr, J. H. Ross, H. R. Roth, C. E. Stockman.

HAWKEY, M. M., Design Engr., Vancouver School Board, Vancouver. REFERENCES: D. M. Drake, S. C. Gale, D. W. Thomson, R. C. Tufts.

JOHNSON, E. M., Product Specialist, Canadian General Electric, Vancouver. REFERENCES: S. C. Gale, D. B. Leaney, D. B. Thomas, R. C. Tufts.

MACKENZIE, J. J., Mgr., Bowyer-Boag Ltd., Winnipeg. REFERENCES: J. F. Bertram, R. L. Kent, A. K. Piercy, D. S. Swain.

MCCARTNEY, K. J., Engr., W. S. Buchanan Ltd., Winnipeg. REFERENCES: C. H. Heddesheimer, R. L. Kent, Ernest Lambert, E. H. Price.

MCCONAGHY, H. E., Owner, H. E. McConaghy Ltd., Vancouver. REFERENCES: S. C. Gale, A. C. Martin, M. E. Minaker, P. Williams*.

PROUDFOOT, R. G., Engr., Public Works, Alberta Government, Edmonton. REFERENCES: E. K. Cumming, Robert McClary*, Donald McKay*, David Panar.

PYATT, GEORGE, Htg. Contr., Agincourt. REFERENCES: W. L. Algie, J. A. Clifton, L. D. Ontonio, G. C. Toms.

WALKER, J. K., Engr., Trane Co. of Canada Ltd., Vancouver. REFERENCES: S. C. Gale, R. W. Hole, A. C. Martin, J. L. Neilans.

England

BADEN, B. E., Design Engr., Matthew Hall & Co. Ltd., London. REFERENCES: P. D. Doulton*, A. H. Jenkins*, S. Kindler, A. C. F. Mackadam*.

France

△MASSIN, PIERRE, Engr., Nessi-Montrouge, Montrouge. REFERENCES: Auguste Beaurrienne, Paul Marchal, Andre Missenard, Andre Nessi.

Italy

STEFANUTTI, UBERTO, Engr., Jucker Co., Milan. REFERENCES: Louis Barfus, J. A. Cutler, A. G. Dixon, M. F. Rather.

Scotland

WEBSTER, G. W., Tech. Mgr., James Lumsden Ltd., Rutherglen. REFERENCES: J. Bolton*, J. M. Newton*, F. S. Spring*, D. B. Swinbanks*.

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CHILDS, J. O.
COWAN, S. M.
CRAGIN, J. D.
FARRAR, C. W., JR.
GARRETT, D. L.
GRIFFIN, M. M.
GROSJEAN, B. W.
HARTWELL, J. D.
MCADAMS, H. L., JR.
MCGAW, R. W.
NIEDERER, DONALD
PARKER, S. A.
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UNIVERSITY OF DETROIT, Detroit, Mich. CERTIFIED BY: J. E. Lay.

EICHENLAUB, J. P.
GLAUBER, J. W.
MANDLE, R. J.
PLEBAN, E. J.
SZEWCZYK, WALTER

PURDUE UNIVERSITY, Lafayette, Ind. CERTIFIED BY: F. B. Morse.

DELAROSA, MIGUEL
DODGE, M. N.
MORGAN, H. R.

OBITUARIES

HARRY E. GERRISH
Minneapolis, Minn.

It is with the most profound regret that we report the death of one of our oldest and most honored members. Harry E. Gerrish, Life Member of the Society and Charter Member of the Minnesota Chapter,

H. E. Gerrish

passed away on February 3, following a minor operation.

Mr. Gerrish, who was president of Morgan-Gerrish Co. at the time of his death, was a native of Minneapolis. He received his M.E. degree in 1905 from the University of Minnesota. His first position was on the West Coast, but he soon returned to Minneapolis to work for the Charles L. Pillsbury Co. He became chief mechanical engineer for that firm of consulting engineers. Mr. Gerrish became president of Morgan-Gerrish in 1911.

In 1918, he was instrumental in organizing the Minnesota Chapter of ASHVE, and was its president in 1931-1932.

From 1938 to 1950, Mr. Gerrish was president of the Alumni Association of the University of Minnesota's Institute of Technology. He was a member of the Delta Upsilon fraternity; Tau Beta Pi, professional scholarship fraternity; and Pi Tau Sigma, professional engineering fraternity. He was a registered professional engineer of the state of Minnesota.

Mr. Gerrish was also very active in civic work. For many years, he was a member of the Rotary Club and took particular interest in the Dowling School for crippled children. For 19 years, he was *Santa Claus* for the Rotary Christmas party at the school. He was also active in YMCA work and served as chairman of the Boy's Work Committee, and as general chairman of the Annual Finance Committee.

Mr. Gerrish was a member of the Lynhurst Masonic Lodge, Scottish Rite, York Rite, and Zuhrah Temple of the Shrine. He also belonged to the Minikahda Club, Minneapolis Club, and Automobile Club.

Our deepest sympathies for their loss are extended to his family. His absence will be felt by everyone in the Society who had the privilege of being associated with this kind and generous man.

Walter Leek

WALTER LEEK
Vancouver, B.C., Canada

The Society has been notified of the death of Walter Leek, on February 1 of this year. Mr. Leek joined the ASHVE in 1903, and became a Life Member in 1937.

Born in Yorkshire, England, he was apprenticed to the family firm of Leek and Company, which was founded by his grandfather in 1808. Mr. Leek's father re-established the firm in Vancouver in 1895 and, when Mr. Leek graduated into the drafting department, he was placed in full charge of the business. He was still company president at the time of his death.

Mr. Leek was instrumental in the establishment of the British Columbia Chapter of the Society. He was also president of the *National Association of Master Plumbers and Heating Contractors of Canada* for two terms.

Mr. Leek took a great interest in civic affairs and was president of the *Pacific National Exhibition Association* for 12 years and its director for 15 years. He also served as a Police Commissioner of his city for two years. He was a charter member of the Kiwanis Club, a member of the Vancouver Board of Trade, and of the *Association of Professional Engineers of British Columbia.*

He is survived by his wife and two sons, one of whom, Charles W. Leek is at present president of the British Columbia Chapter of the Society.

MICHAEL B. SHEA
Wayne, Pa.

Life Member, Michael B. Shea, passed away on March 8. Born in Attica, N.Y., in 1877, Mr. Shea received his M.E. degree from Cornell University in 1900.

Mr. Shea's first position was with the Engineering Department of the Bell Telephone Co., Pittsburgh, and from 1901 to 1907 he was associated with Baker Smith & Co. in the Pittsburgh office, designing and supervising heating, ventilating and power

M. B. Shea

plants. He was in charge of steam heating and ventilating for the American Warming and Ventilating Co., Pittsburgh, from 1907 to 1910. From 1910 until his retirement in 1947, Mr. Shea was with the American Radiator Co. He started in the sales engineering department and was assistant manager and branch manager at Omaha, Cleveland and Detroit, spending most of his association with the company in Detroit. Mr. Shea was widely known in the heating industry, being the first gas engineer ever employed by American Radiator Co. He made numerous invaluable

JOURNAL SECTION

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Headquarters: 62 Worth St., New York 13, N. Y. **Research Laboratory:** 7218 Euclid Ave., Cleveland 3, Ohio

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contributions to that phase of heating.

Mr. Shea was an active member of the Michigan Chapter of ASHVE and a familiar figure at Society meetings.

Surviving Mr. Shea are three daughters, to whom the Society extends its deepest sympathy for their loss.

ROY BRAUER
Pittsburgh, Pa.

Roy Brauer, member of the Society since 1925, died in the early part of this year. Born in Chicago on April 8, 1897, Mr. Brauer attended Chicago schools, including the University of Illinois.

He began his professional career with Buffalo Forge Co. as a draftsman and later sales engineer. During his career he was also associated with such firms as the Illinois Engineering Co., Chicago, Ill., as draftsman and later chief draftsman, and the Schley & Nash Co., Pittsburgh, Pa., as chief engineer. At the time of his death he was owner of his own firm, the Ventilating Equipment Co.

GEORGE A. GRAY
Ottawa, Ont., Canada

George A. Gray, Society member since 1924, died at his home in Ottawa on February 20 following a lengthy illness.

He was born in Hiawatha, Ont., and received his education at Hiawatha and Peterborough schools. During World War I he served overseas with the Royal Canadian Artillery. Mr. Gray, a mechanical engineer, was Ottawa branch manager of C. A. Dunham Co., Ltd. at the time of his death. Previously he held similar positions with the company in Halifax and Toronto.

Mr. Gray was a member of the Ottawa Board of Trade, the Ottawa Rotary Club, the *Association of Professional Engineers of Ontario* and Doric Lodge No. 316, AF and AM.

Mr. Gray is survived by his wife, the former Charlotte Spackman of England, and five sons and three daughters, to whom the Society extends its deep sympathy.

JAMES H. EAGEN
McKeesport, Pa.

The Society has been notified of the passing of James H. Eagen, member of the Society since 1919. Mr. Eagen died on February 13.

Born in Ridgway, Pa., Mr. Eagen attended The Pennsylvania State College, where he received his B.S. in architectural engineering in 1927. During his business career, Mr. Eagen specialized in the design of heating systems for larger building projects. Mr. Eagen joined the architectural-engineering firm of Hoffman & Crumpton, Pittsburgh, in 1947 as an engineer and was an associate partner at the time of his death.

He was a registered professional engineer in the state of Pennsylvania, and a member of the *American Institute of Architects*, the *Pennsylvania Society of Professional Engineers*, and the *I.E.S.*

Surviving Mr. Eagen are his widow, Mary Muir Eagen, a son and daughter, to whom the Officers and Council of the Society extend their sympathy.

FLOYD J. PARKER
Jackson, Miss.

It is with deep regret that the Society reports the untimely passing of one of our newest members, Floyd J. Parker, Jr.

Born on July 7, 1915 in Butler, Pa., he completed his education there and began his professional career with the firm of Melchior, Armstrong, Dessau Co., Inc., in Harrisburg as manager. From 1940 to 1945 Mr. Parker served with the United States Army Air Force. Following the war Mr. Parker was associated with the Harrisburg Refrigeration Co. in the service and installation department and Industrial Suppliers, Inc., as manager of the Refrigeration Division. He became associated with Acme Heating and Cooling of Jackson, Miss., in 1950, and at the time of his death he was sales manager for Paine Refrigeration Supply Co., also of Jackson.

Mr. Parker was an associate member of the *Refrigeration Service Engineers Society*.

The Officers and Council extend their sincere sympathy to his widow.

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ASHVE — OFFICERS OF CHAPTERS AND BRANCHES

(52 Chapters—1 Special Branch—9 Student Branches)

Date indicates year organized; an address and no city shown signifies same city as headquarters; numeral in parentheses indicates zone.

● **ARKANSAS:** 1952. Hdqrs., Little Rock, Ark. Meets, Third Tuesday. PRESIDENT, Herman Cumnock, 401 W. Capitol Ave. SECRETARY, W. J. Franklin, 1516 S. Pierce St.

● **ATLANTA:** 1937. Hdqrs., Atlanta, Ga. Meets, Second Monday. PRESIDENT, J. G. Croley, 400 Batavia St., East Point, Ga. SECRETARY, T. A. Barrow, 157 Simpson St., N.W.

● **BALTIMORE:** 1949. Hdqrs., Baltimore, Md. Meets, Third Wednesday. PRESIDENT, E. R. Kent, 2322 N. Charles St. (18). SECRETARY, A. M. Kroft, 401 Tower Bldg. (2).

● **BRITISH COLUMBIA:** 1952. Hdqrs., Vancouver, B.C., Canada. PRESIDENT, M. E. Minaker, 1128 Burrard St. SECRETARY, D. W. Thomson, 445 Richards St.

● **CENTRAL NEW YORK:** 1944. Hdqrs., Syracuse, N. Y. Meets, Fourth Wednesday. PRESIDENT, C. R. Acheson, 306 W. Genessee St. SECRETARY, H. K. Ormsby, 205 S. Townsend St. (2).

● **CENTRAL OHIO:** 1944. Hdqrs., Columbus, Ohio. Meets, Third Monday. PRESIDENT, N. T. Hess, 63 E. Goodale St. SECRETARY, R. A. Wilson, 20 S. Third St. (15).

● **CINCINNATI:** 1932. Hdqrs., Cincinnati, Ohio. Meets, First Tuesday. PRESIDENT, H. E. Russell, 4th & Main Sts., Box 960. SECRETARY, F. W. Wilson, 222-24 E. 14th St.

● **CONNECTICUT:** 1940. Hdqrs., New Haven, Conn. Meets, Third Thursday. PRESIDENT, T. L. Arnold, 179 South St., W., Hartford (6). SECRETARY, C. L. L'Hommedieu, 76 Blatchley Ave.

● **DELTA:** 1939. Hdqrs., New Orleans, La. Meets, Third Tuesday. PRESIDENT, Walter Cooke, 816 Howard Ave. (13). SECRETARY, T. J. Jenny, 1000 S. Peters St. (9).

● **EMPIRE STATE CAPITAL:** 1951. Hdqrs., Albany, N. Y. PRESIDENT, Harry Horowitz, 889 Warren St. (3). SECRETARY, R. J. Tougher, Menands Rd., Loudonville, N. Y.

● **GOLDEN GATE:** 1937. Hdqrs., San Francisco, Calif. Meets, First Thursday. PRESIDENT, T. J. White, 625 Market St. (5). SECRETARY, Eric Roberts, 417 Market St. (5).

● **ILLINOIS:** 1906. Hdqrs., Chicago, Ill. Meets, Second Monday. PRESIDENT, M. W. Bishop, Rm. 1504, 228 N. LaSalle St. (1). SECRETARY, G. V. Zintel, 1217 W. Washington Blvd. (7).

● **INDIANA:** 1943. Hdqrs., Indianapolis, Ind. Meets, Fourth Tuesday. PRESIDENT, J. T. Hardin, 720 Noble St. (2). SECRETARY, P. O. Patterson, 2701 Roosevelt Ave., (18).

● **INLAND EMPIRE:** 1950. Hdqrs., Spokane, Wash. Meets, First Friday after First Tuesday. PRESIDENT, T. P. Nau, S. 1419 Walnut (9). SECRETARY, H. A. Bickel, E. 7 Riverside Ave.

● **IOWA:** 1940. Hdqrs., Des Moines, Ia. Meets, Second Tuesday. PRESIDENT, R. H. Schnell, 4119 Northwest Dr. (10). SECRETARY, Bowen Campbell, 1435 Casady Dr. (5).

● **KANSAS:** 1951. Hdqrs., Wichita, Kan. Meets, Tuesday after First Monday. PRESIDENT, O. P. Bullock, 254 Laura (7). SECRETARY, H. D. Speyer, 120 Ida.

● **KANSAS CITY:** 1917. Hdqrs., Kansas City, Mo. Meets, First Monday. PRESIDENT, W. A. Reichow, 1621 E. 31st St. (3). SECRETARY, J. G. Barnes, Jr., 1924 Oak St.

● **MANITOBA:** 1935. Hdqrs., Winnipeg, Man., Canada. Meets, Third Thursday. PRESIDENT, W. J. Atkinson, 812 Boyd Bldg. SECRETARY, Ernest Lambert, 93 Lombard St.

● **MASSACHUSETTS:** 1912. Hdqrs., Boston, Mass. Meets, Third Tuesday. PRESIDENT, G. B. Torrens, 15 Alden Lane, Shrewsbury. SECRETARY, G. D. Fife, Rm. 606, 79 Milk St. (9).

● **MEMPHIS:** 1944. Hdqrs., Memphis, Tenn. Meets, Third Monday. PRESIDENT, W. L. Drake, 15 N. Reese. SECRETARY, A. T. Bevil, 1638 Union Ave. (4).

● **MIAMI VALLEY:** 1950. Hdqrs., Dayton, Ohio. Meets, First Wednesday. PRESIDENT, D. L. Bergman, Box 95, Riverdale Sta. (5). SECRETARY, D. E. Tullis, 743 Kiser St. (4).

● **MICHIGAN:** 1916. Hdqrs., Detroit, Mich. Meets, First Monday after 10th of month. PRESIDENT, C. A. Strand, 9117 Hamilton Ave. (2). SECRETARY, D. S. Falk, 4864 Woodward Ave. (1).

● **MINNESOTA:** 1918. Hdqrs., Minneapolis, Minn. Meets, First Monday. PRESIDENT, William Sturm, 2160 Highland Pkwy., St. Paul (5). SECRETARY, J. G. Hamm, 850 Cromwell Ave., St. Paul (4).

● **MONTREAL:** 1936. Hdqrs., Montreal, Que., Canada. Meets, Third Monday. PRESIDENT, W. G. Hole, 7035 Grand Ave. (14). SECRETARY, D. L. Lindsay, 1411 Crescent St. (25).

● **NEBRASKA:** 1940. Hdqrs., Omaha, Neb. Meets, Second Tuesday. PRESIDENT, S. W. Black, 18th & Harney Sts. SECRETARY, H. H. Ulrich, 608 City Hall (2).

● **NEW YORK:** 1911. Hdqrs., New York, N. Y. Meets, Third Monday. PRESIDENT, P. B. Gordon, 222 E. 41st St. (17). SECRETARY, Carl H. Flink, 62 Worth St. (13).

● **NORTH JERSEY:** 1952. Hdqrs., Newark, N. J. Meets, Second Tuesday. PRESIDENT, F. H. Faust, 5 Lawrence St., Bloomfield. SECRETARY, C. H. Smith, 2490 Vreeland Mills Rd., Linden.

● **NORTH TEXAS:** 1938. Hdqrs., Dallas, Tex. Meets, Third Monday. PRESIDENT, P. N. Vinther, 929 Mercantile Securities Bldg. SECRETARY, J. A. Ray, 4411 Belmont Ave. (4).

● **NORTHEASTERN OKLAHOMA:** 1948. Hdqrs., Tulsa, Okla. Meets, Second Tuesday. PRESIDENT, J. N. Watt, 528 E. Fifth. SECRETARY, J. C. Netherton, Jr., 3130 E. 44th St.

● **NORTHERN OHIO:** 1916. Hdqrs., Cleveland, Ohio. Meets, Second Monday. PRESIDENT, R. E. Sherman, 570 Hanna Bldg. (15). SECRETARY, R. G. Huebscher, 7218 Euclid Ave. (3).

● **NORTHERN PIEDMONT:** 1952. Hdqrs., Greensboro, N.C. PRESIDENT, J. E. Hart, 1001 E. Bessemer Ave. SECRETARY, S. T. Oliver, 2307 Fairfield Ave.

● **OKLAHOMA:** 1935. Hdqrs., Oklahoma City, Okla. Meets, Second Monday. PRESIDENT, W. J. Collins, Jr., 1708 Westminster Pl. SECRETARY, F. X. Loeffler, Jr., 1604 N. W. Fifth St.

● **ONTARIO:** 1922. Hdqrs., Toronto, Ont., Canada. Meets, First Monday. PRESIDENT, J. H. Ross, 1251 Yonge St. SECRETARY, H. R. Roth, 57 Bloor St., W.

● **OREGON:** 1939. Hdqrs., Portland, Ore. Meets, Thursday after First Tuesday. PRESIDENT, A. N. Hoss, 621 S.W. Alder (5). SECRETARY, J. E. Finkbeiner, 10260 S.W. Daphne Pl. (1).

● **OTTAWA VALLEY:** 1952. Hdqrs., Ottawa, Ont., Canada. PRESIDENT, Bernard Stotesbury, 955 Somerset St. W. SECRETARY, E. J. Schoenherr, 32 Clarey Ave. (1).

● **PACIFIC NORTHWEST:** 1928. Hdqrs., Seattle, Wash. Meets, Second Tuesday. PRESIDENT, W. B. Pride, 3111 Dose Ter. (44). SECRETARY, I. L. Winsor, P.O. Box 7077, Riverton Hgts, Br. (88).

● **PHILADELPHIA:** 1916. Hdqrs., Philadelphia, Pa. Meets, Second Thursday. PRESIDENT, M. E. Barnard, 12 S. 12th St. (7). SECRETARY, C. J. Lubking, 5060 Wayne Ave.

● **PITTSBURGH:** 1919. Hdqrs., Pittsburgh, Pa. Meets, Third Monday. PRESIDENT, B. B. Reilly, Fifth & Liberty Aves. (22). SECRETARY, E. H. Riesmeyer, Jr., 231-33 Water St. (22).

● **ROCKY MOUNTAIN:** 1944. Hdqrs., Denver, Colo. Meets, First Wednesday. PRESIDENT, L. H. Wray, 1101 Geneva St., Aurora. SECRETARY, J. F. Cipra, Jr., 2676 S. Madison St.

● **SACRAMENTO VALLEY:** 1952. Hdqrs. Sacramento, Calif. PRESIDENT, L. A. O'Meara, 1400 Tenth St. SECRETARY, J. E. Marshall, 441 Pico Way (19).

● **ST. LOUIS:** 1918. Hdqrs., St. Louis, Mo. Meets, Second Tuesday. PRESIDENT, C. H. Burnap, 235 Kerulsh Pl., Webster Groves (19). SECRETARY, J. F. Naylor, Jr., 2335 S. Grand Ave. (4).

● **SHREVEPORT:** 1948. Hdqrs., Shreveport, La. Meets, Third Thursday. PRESIDENT, W. S. Evans, 614 Johnson Bldg. SECRETARY, J. S. Malahy, Jr., 1839 Line Ave.

● **SOUTH TEXAS:** 1938. Hdqrs., Houston, Tex. Meets, Third Friday. PRESIDENT, C. L. Fleming, 809 M. & M. Bldg. SECRETARY, J. W. Holland, 245 Esperson Bldg. (2).

● **SOUTHERN CALIFORNIA:** 1930. Hdqrs., Los Angeles, Calif. Meets, First Tuesday. PRESIDENT, J. S. Earhart, 2734 Fleur Dr., San Marino (9). SECRETARY, C. D. Walz, 3600 San Pasqual St., Pasadena (10).

● **SOUTHERN PIEDMONT:** 1952. Hdqrs., Charlotte, N.C. PRESIDENT, R. E. Mason, 1726 Hutchinson Ave. (1). SECRETARY, S. B. Blanton, Box 6096.

● **SOUTHWEST TEXAS:** 1946. Hdqrs., San Antonio, Tex. Meets, Third Tuesday. PRESIDENT, D. E. Locher, Box 949, Corpus Christi. SECRETARY, F. B. Frazee, 1013 Riverside Dr., Austin.

● **UTAH: 1944.** Hdqrs., Salt Lake City, Utah. Meets, Third Thursday. PRESIDENT, D. R. Wilde, 2634 S. 19th E. (1). SECRETARY, Alfred Richeda, P.O. Box 479 (9).

● **VIRGINIA:** 1946. Hdqrs., Norfolk, Va. Meets, Third Wednesday. PRESIDENT, E. D. Duval, 1023 Hanover Ave. SECRETARY, T. B. Carpenter, 412 Chester St.

● **WASHINGTON, D. C.:** 1935. Hdqrs., Washington, D. C. Meets, Second Wednesday. PRESIDENT, G. R. Walz, 5214 25th Pl. N., Arlington (7) Va. SECRETARY, W. C. Reamy, Jr., 17th & Pennsylvania Ave., N.W. (6).

● **WESTERN MICHIGAN:** 1931. Hdqrs., Grand Rapids, Mich. Meets, Second Monday. PRESIDENT, H. R. Limbacher, 760 E. Vine St., Kalamazoo. SECRETARY, F. K. Platt, P.O. Box 307, Kalamazoo.

● **WESTERN NEW YORK:** 1919. Hdqrs., Buffalo, N. Y. Meets, Second Monday. PRESIDENT, J. M. Quackenbush, 505 Franklin St. (2). SECRETARY, Q. P. Thompson, 260 Richmond Ave. (22).

● **WISCONSIN:** 1922. Hdqrs., Milwaukee, Wis. Meets, Third Monday. PRESIDENT, J. A. Lotte, 2505 N. 97th St., Wauwatosa (10). SECRETARY, I. J. Rossiter, 231 W. Wisconsin (3).

SPECIAL BRANCH

● **SWISS:** 1952. Hdqrs., Zurich, Switzerland. PRESIDENT, Leo de Bruyn, Muhlebachstr, 172, Zurich. SECRETARY, Walter Hausler, Erbstrasse 2, Kusnacht, Zurich.

STUDENT BRANCHES

● **NORTH CAROLINA STATE COLLEGE:** 1948. Hdqrs., Raleigh, N. C. PRESIDENT, Sydney Narvey, 5-B Vetville, State College Station. SECRETARY, E. A. Travis, Jr., P.O. Box 3332, College Station.

● **OKLAHOMA A. & M. COLLEGE:** 1950. Hdqrs., Stillwater, Okla. PRESIDENT, E. M. Todd, Jr., 139 N. Duncan. SECRETARY, R. P. Schmidt, 310 S. Knoblock.

● **OREGON STATE COLLEGE:** 1949. Hdqrs., Corvallis, Ore. Meets, First Wednesday after First Tuesday. PRESIDENT, R. E. Bulletsel, 252 Kings Rd. SECRETARY, I. P. Parkhurst, 1354 Harrison.

● **PURDUE UNIVERSITY:** 1948. Hdqrs., W. Lafayette, Ind. CHAIRMAN, N. J. Kirch, 922 Highland Ave., Lafayette. SECRETARY, H. F. Allen, Jr., 629 University St.

● **TEXAS A. & M. COLLEGE:** 1946. Hdqrs., College Station. Meets, Second and Fourth Tuesday. PRESIDENT, J. O. Kadel, Box 4054. SECRETARY, W. C. Haggard, Box 5227.

● **UNIVERSITY OF DETROIT:** 1949. Hdqrs., Detroit, Mich. Meets, First Tuesday. PRESIDENT, T. J. Feahney, Jr., 18263 Oak Dr. (21). SECRETARY, W. F. Thull, 18313 New Jersey (19).

● **UNIVERSITY OF KANSAS:** 1949. Hdqrs., Lawrence, Kans. Address mail to Dr. Warren E. Snyder, chairman, Dept. of Mechanical Engineering, University of Kansas.

● **UNIVERSITY OF TEXAS:** 1949. Hdqrs., Austin, Tex. Meets, First and Third Tuesday. PRESIDENT, H. M. Braymer, 1307-C Brackenridge Apts., (3). SECRETARY, A. D. Wilkinson, Jr., 1423-B Brackenridge Apts., (3).

● **UNIVERSITY OF TORONTO:** 1951. Hdqrs., Toronto, Ont. CHAIRMAN, D. S. Harper, 737 Sammon Ave. SECRETARY, L. S. Mitchell, 88 Lawrence Crescent.

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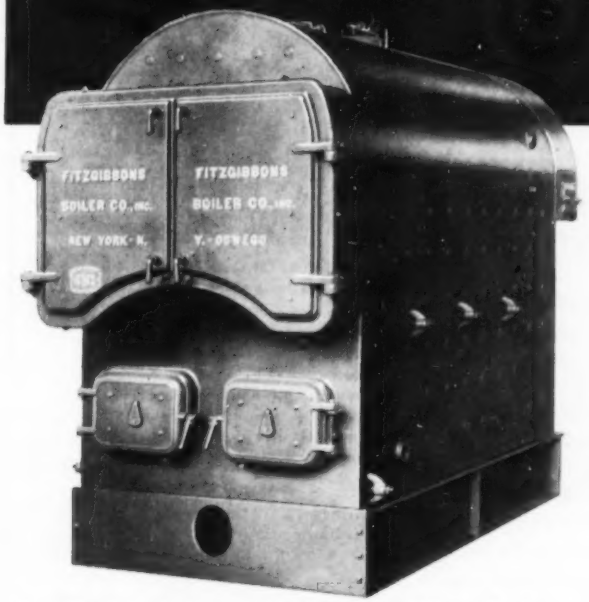

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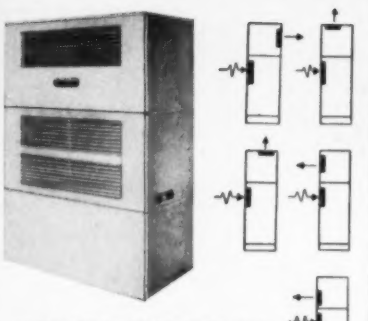

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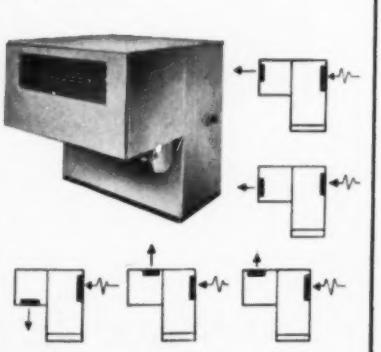

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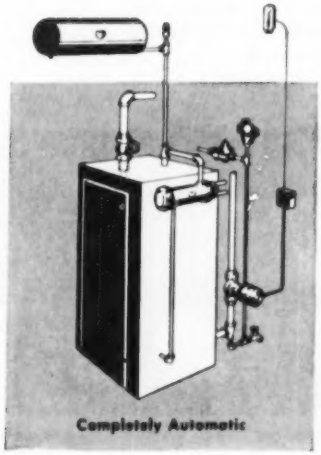

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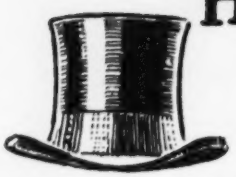
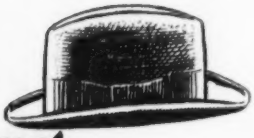


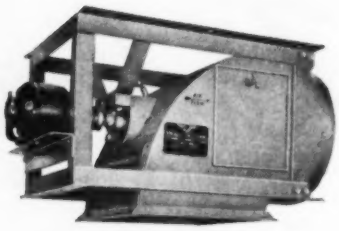
High Hats are out of date

now— it's the Homburg



High Chimneys, too, are out of date

now— it's the WING DRAFT INDUCER

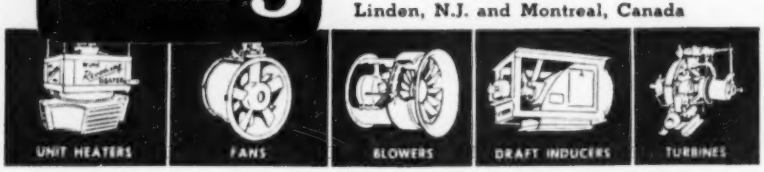


Why? Because your heating plant can have positive, adequate, uniform draft without the need for tall, unsightly, expensive stacks. Unlike variable chimney draft, the Wing Draft Inducer gives perfect motorized draft in any weather. It cuts fuel costs by giving higher CO_2's. Smoking is reduced or eliminated. The capacity of your boiler plant is increased.

Write for a copy of Bulletin I-52

Wing

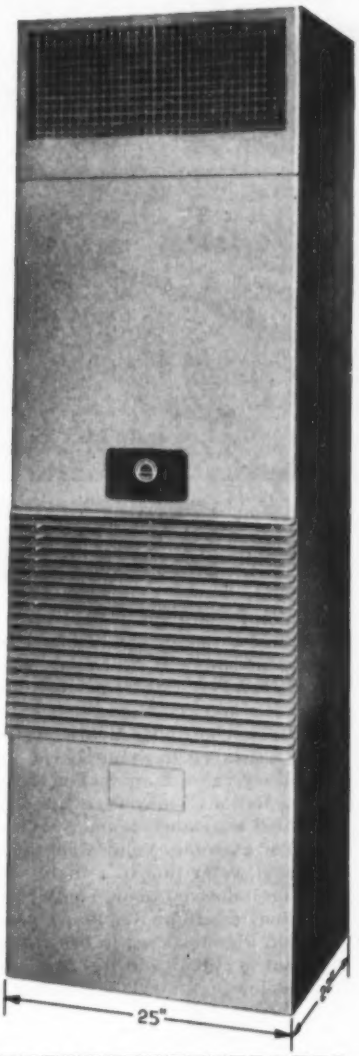
L. J. Wing Mfg. Co.
140 Vreeland Mills Road
Linden, New Jersey
Factories:
Linden, N.J. and Montreal, Canada



Announcing THE NEW, COMPACT

AMERICAN-STANDARD PACKAGED AIR CONDITIONER

for commercial establishments



Here's a self-contained unit that comfort cools, dehumidifies, ventilates, cleans and circulates the air . . . also readily arranged for winter heating!

Note the *many advantages*

this new unit offers your customers:

- **4-WAY ADJUSTABLE GRILLES** discharge air at any angle above head level.
- **ADJUSTABLE FAN MOTOR PULLEY** permits air volume adjustment to fit application.
- **CABINET IS ACOUSTICALLY INSULATED** for quiet operation.
- **"HUMID WEATHER" CONTROL** removes additional moisture from air on muggy days.
- **HEATING COIL,** using either steam or hot water, can be furnished at additional cost.
- **ALL AIR IS FILTERED** as it passes through the unit.
- **CONTROLS ARE CONCEALED.** Adjustable thermostat regulates air temperature. Fan can be operated separately without cooling.
- **REFRIGERANT CIRCUIT** is completely hermetically-sealed.
- **COMPACT DESIGN** saves valuable floor space. (dimensions shown for 2 and 3HP units).
- **EASY TO INSTALL**—conditioner is shipped ready for electrical, water and drain connections.

For further information, contact your wholesale distributor or send for Form No. 403.

American-Standard
Dept. HP-53, Pittsburgh 30, Pa.
Please send me Form No. 403 describing the Packaged Air Conditioner.

Name _____

Company _____

Address _____

City _____ State _____

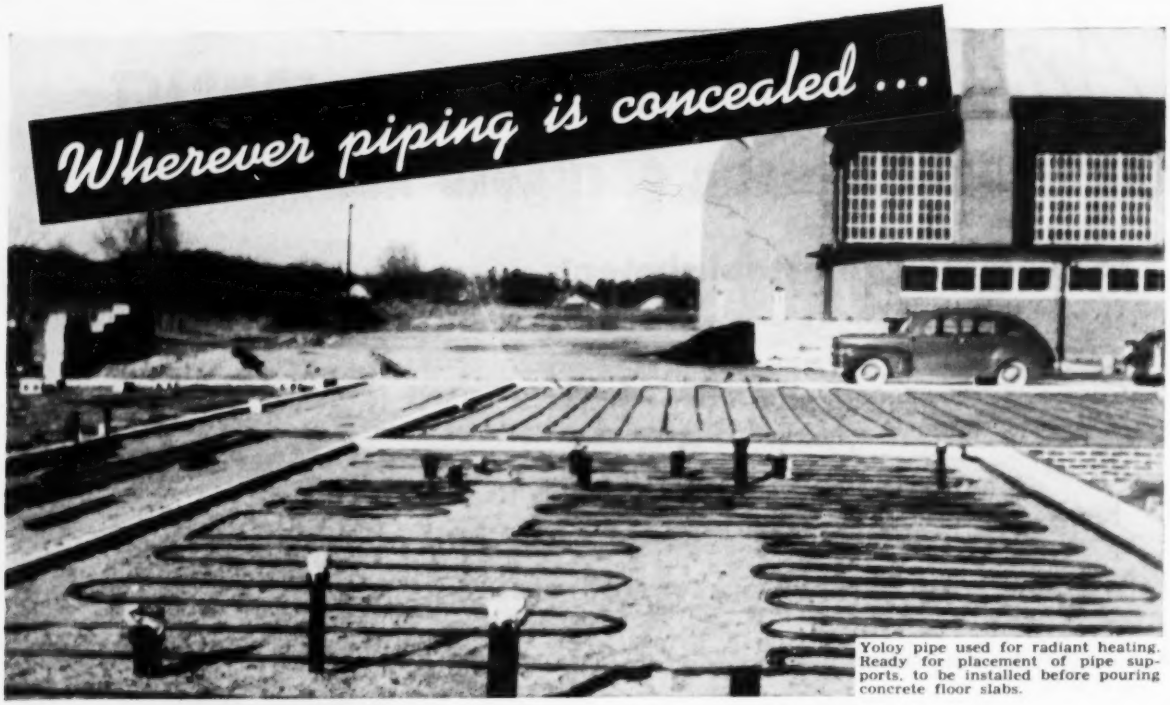
AMERICAN-Standard
AIR CONDITIONING

American Radiator & Standard Sanitary Corporation, Pittsburgh 30, Pa.

Serving home and industry

AMERICAN-STANDARD • AMERICAN BLOWER • CHURCH SEATS & WALL TILE • DETROIT CONTROLS • KEWANEE BOILERS • ROSS EXCHANGERS

Wherever piping is concealed . . .



Yoloy pipe used for radiant heating. Ready for placement of pipe supports, to be installed before pouring concrete floor slabs.

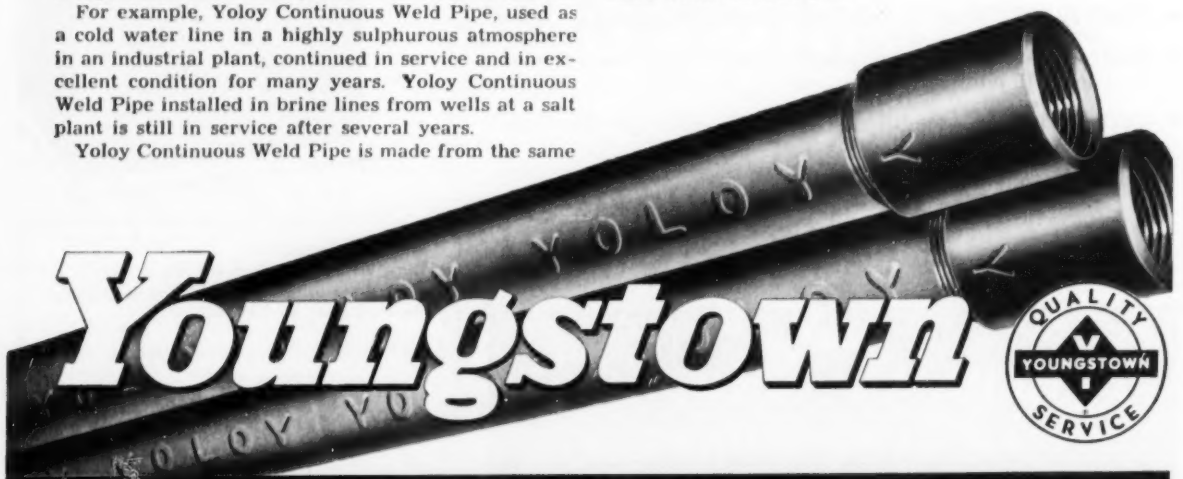
use YOLOY *continuous weld pipe*

Yoloy Continuous Weld Pipe offers distinct advantages for radiant heating and snow removal. Its use is recommended whenever piping is concealed—in industrial plants, commercial buildings, hospitals, schools and residences.

In standard tests Yoloy steel has demonstrated that its resistance to atmospheric corrosion is four to six times greater than that of regular steels. In actual installations Yoloy Pipe has demonstrated that it has a high resistance to many other corrosive conditions.

For example, Yoloy Continuous Weld Pipe, used as a cold water line in a highly sulphurous atmosphere in an industrial plant, continued in service and in excellent condition for many years. Yoloy Continuous Weld Pipe installed in brine lines from wells at a salt plant is still in service after several years.

Yoloy Continuous Weld Pipe is made from the same nickel-copper steel composition that has proved so successful in service in the oil, mining, railroad, chemical, trucking and other industries where resistance to corrosion and abrasion is of prime importance. This pipe is easy to thread and fabricate with standard pipe tools. It can be electric or gas welded readily. It has high strength and high resistance to abrasion, shock and vibration fatigue. For further information, write or phone the Youngstown District Sales Office nearest you.



Youngstown

QUALITY YOUNGSTOWN SERVICE

THE YOUNGSTOWN SHEET AND TUBE COMPANY

General Offices — Youngstown 1, Ohio

Manufacturers of Carbon, Alloy and Yoloy Steel

Export Office - 500 Fifth Avenue, New York

COLD FINISHED CARBON AND ALLOY BARS · ELECTROLYTIC TIN PLATE · COKE TIN PLATE · WIRE · PIPE AND TUBULAR PRODUCTS · CONDUIT · RODS · SHEETS · PLATES · BARS · RAILROAD TRACK SPIKES.

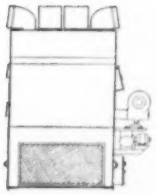
Rugged Construction

Here is a heater that is engineered for rugged durability to give smooth operation and long life.

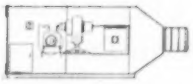
The Olson Heater is built over a rigid base to provide a smooth, vibration free, operation. The heavy drive shaft and low fan speed means a quiet, effortless output, obtained only by Olson superior construction methods. — Look over the Olson — it stands for high quality right down the line — large self-aligning ball bearings, heavy outside casing with radiation shields and ample relief and access doors.

Yes, Olson Heaters are really built rugged. They provide a long life of efficient service, free from trouble.

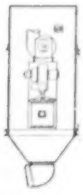
There is an OLSON heater to meet any heating requirement for space heating and special adaptions.



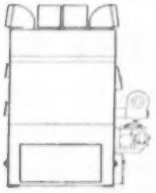
FLOOR MODEL



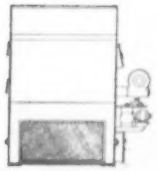
HORIZONTAL MODEL



INVERTED MODEL



RETURN AIR DUCT



DUCT TOP

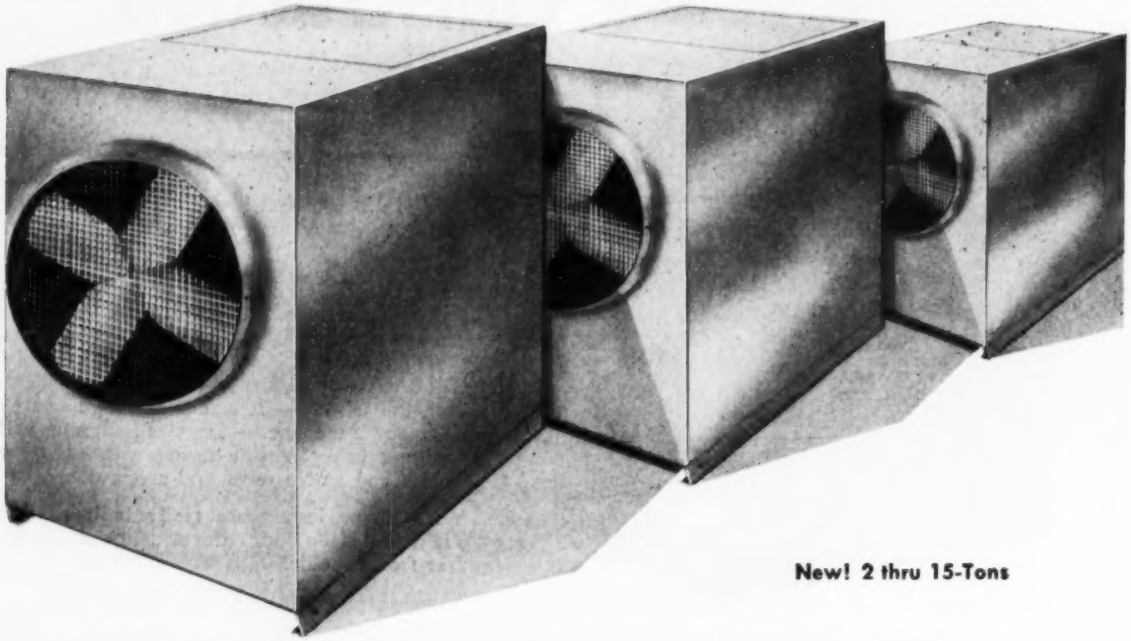
ARTHUR A. OLSON & COMPANY
BROAD ST CANFIELD OHIO

Mail this coupon for further information about sizes and ranges, detailed operation.

Representatives in principal cities.

ARTHUR A. OLSON & COMPANY
CANFIELD, OHIO
Please send me Olson Direct Fired Heater Catalog.
Name.....
Firm.....
Address.....
City.....State.....

RESIDENTIAL COOLING TOWERS



New! 2 thru 15-Tons

ONLY HALSTEAD & MITCHELL OFFERS THE

20-Year Guarantee!

ON THE WETTED DECK SURFACE

PRICED FOR THE HOME MARKET

Price-wise these Halstead & Mitchell Residential Cooling Towers throw open huge segments of the home and small building market to air-conditioning. Here is the development for which the industry has been waiting. Check prices today!

NOW REQUIRED IN MANY AREAS

Residential Cooling Towers recirculate precious water . . . meet requirements of municipalities which prohibit wasting cooling water to sewers. And low cost H&M units take residential air conditioning to the suburbs and rural area . . . recirculate from a cistern if need be!

MADE FOR REAL OPERATING ECONOMY

Economical, lastworthy . . . low operating cost matches low initial cost. Efficient gravity-type distributing pan eliminates windage loss since atomizing by spray nozzle is unnecessary. Low pump head pressure is another bonus of gravity distribution. And maintenance is a snap!

FAMOUS HALSTEAD & MITCHELL QUALITY

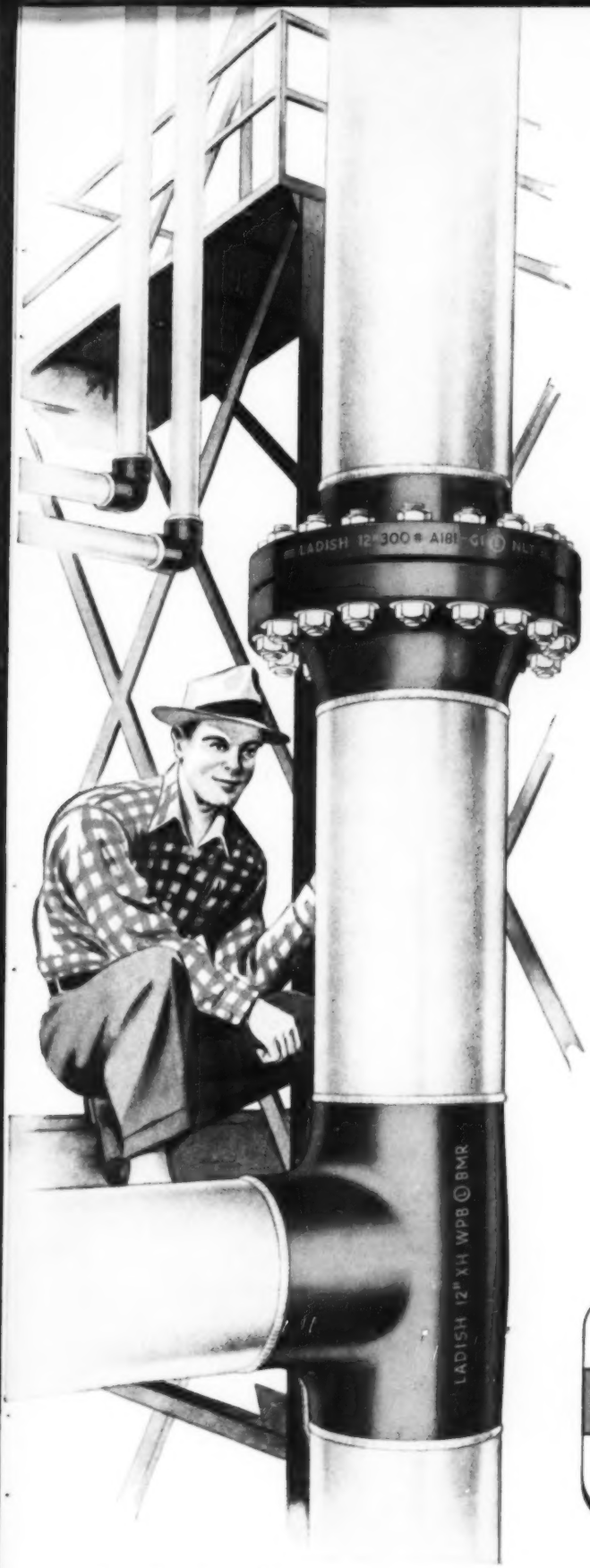
Here's *all* the quality for which Halstead & Mitchell Cooling Towers are world famous — including the 20-year Guarantee on the wetted deck surface of pressure-treated creosoted wood, against attack by rotting or fungi growth. Stainless steel fans and shafts, plus individual cabinet coatings of Vinsynite, Vinyl Zinc and chlorinated rubber add important years of life. The complete assembly is with Everdur bolts . . . disassembly is easy even after years of service.

AT LEADING WHOLESALERS EVERYWHERE

Write for descriptive bulletin from Halstead & Mitchell, one of the world's largest manufacturers of water-cooled Cleanable Condensers, and Cooling Towers up through 100-tons.

Halstead & Mitchell

OFFICES: BESSEMER BUILDING • PITTSBURGH 22, PA.



LADISH

Controlled Quality

PIPE FITTINGS

maximum service assured by metallurgical soundness

Sound metallurgy . . . the result of unsurpassed facilities and advanced laboratory controls . . . provides the maximum of dependability in Ladish Controlled Quality fittings. Every phase of metal quality . . . composition, structure and physical properties . . . is continuously safeguarded — and certified proof of metallurgical integrity is available to users of Ladish fittings.

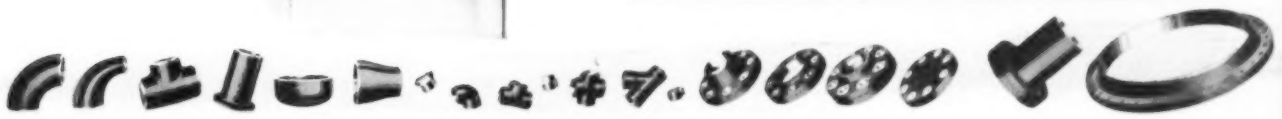
TO MARK PROGRESS

THE COMPLETE *Controlled Quality* FITTINGS LINE
PRODUCED UNDER ONE ROOF...ONE RESPONSIBILITY

LADISH CO.

CUDAHY, WISCONSIN
MILWAUKEE SUBURB

District Offices: New York • Buffalo • Pittsburgh • Philadelphia • Cleveland • Chicago • St. Paul
St. Louis • Atlanta • Houston • Tulsa • Los Angeles • San Francisco • Havana • Mexico City • Brantford, Ont.



IT'S FLATTENED OUT

TO GIVE YOU MORE HEADROOM!

IT'S DIVIDED IN HALF TO GO

THROUGH NARROW OPENINGS!

SPENCER'S *New Low-Waterline* BOILER

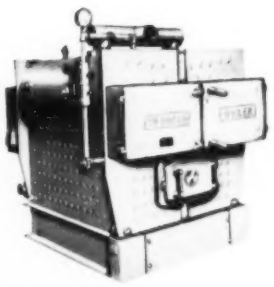
An outstanding success! Here's why Spencer's new boiler, introduced a few short months ago, has already won wide acceptance:

In existing buildings—divided design permits entry through narrow basement openings. No tearing out of walls. The two watertight sections can be moved in separately, yet require no welding for installation.

In new buildings—overall height of this new boiler is approximately 25% less than conventional firebox boilers . . . makes possible lower basement ceilings . . . cuts down excavation expenses.

Other time-tested Spencer advantages: It's *quickly convertible* from mechanical to hand firing. It's *fast steaming*, thanks to its staggered rows of fire tubes. It's *self-cleaning*. Has a high firebox and *instantaneous or tank-type service water coils* in a wide range of capacities.

Only one of Spencer's Quality Line of Commercial and Residential Boilers

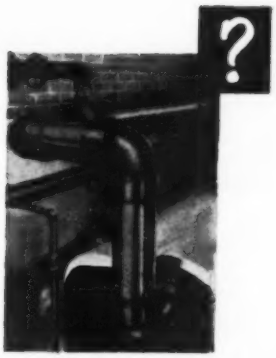


Spencer's Divided Low-Waterline Boiler is available in sizes from 3,500 to 42,500 sq. ft., steam.

SPENCER HEATER
LYCOMING-SPENCER DIVISION
WILLIAMSPORT PENNSYLVANIA

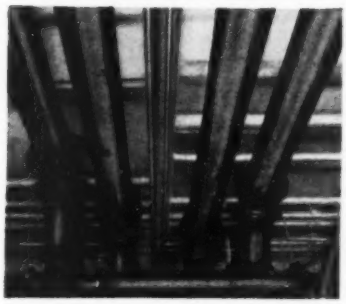
H SBI

THERE IS A SPENCER FOR EVERY BUILDING . . . FOR EVERY FUEL



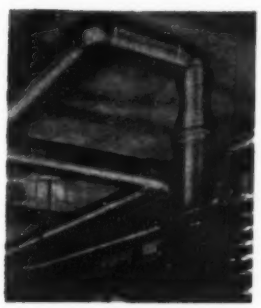
Quick Quiz

on copper piping



Q **What is the relative cost of pumping through copper tubes as against piping made of other metals?**

A It costs less, size for size, to pump through the smooth bore of ANACONDA Copper Tubes, which remain smooth because copper is corrosion-resistant, resists building up of deposits that impede flow.



Q **Aside from plumbing and heating, can copper tubing also be used to carry steam, oils, refrigerants, gases and other chemicals?**

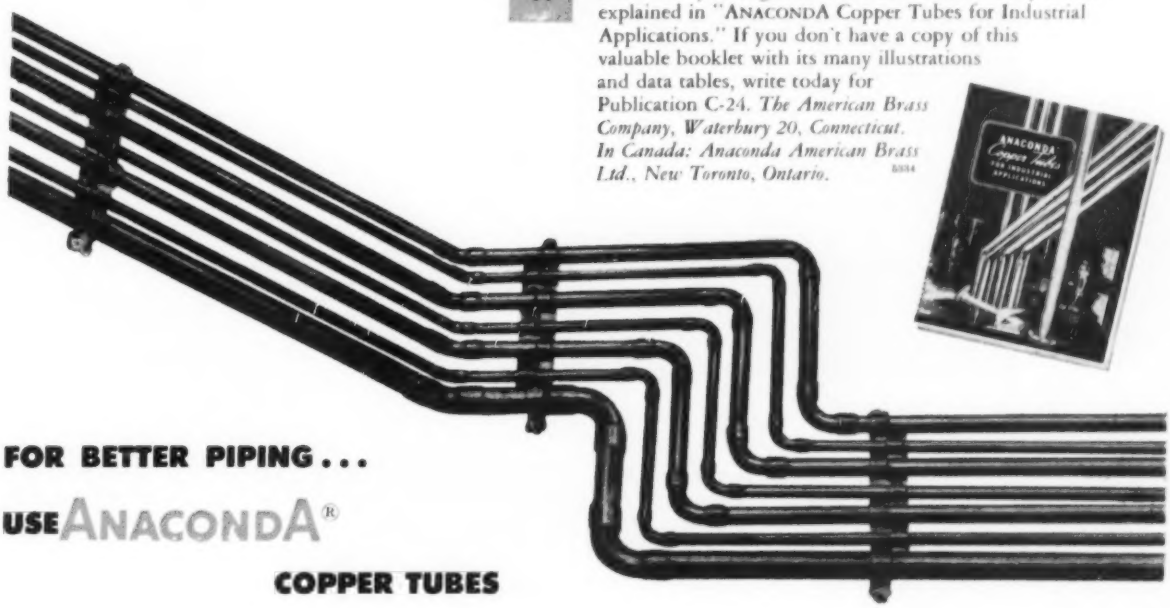
A Yes. Practically every industry in the country has installed copper tubing for these purposes. In addition, it's simpler to install ANACONDA Copper Tubing; it takes less room, is easy to dismantle, and can be soldered or brazed.

Q **Is it possible to use smaller pipe sizes when installing copper tubing than when installing other kinds of piping?**

A It certainly is—ANACONDA Copper Tubes retain a smooth bore, and there is no accumulation of rust and deposits which in ordinary piping reduce the volume and speed of flow.

Q **Does copper tubing do a better piping job in any other important ways?**

A Lots—and you ought to know about them. They are all explained in "ANACONDA Copper Tubes for Industrial Applications." If you don't have a copy of this valuable booklet with its many illustrations and data tables, write today for Publication C-24. *The American Brass Company, Waterbury 20, Connecticut. In Canada: Anaconda American Brass Ltd., New Toronto, Ontario.*

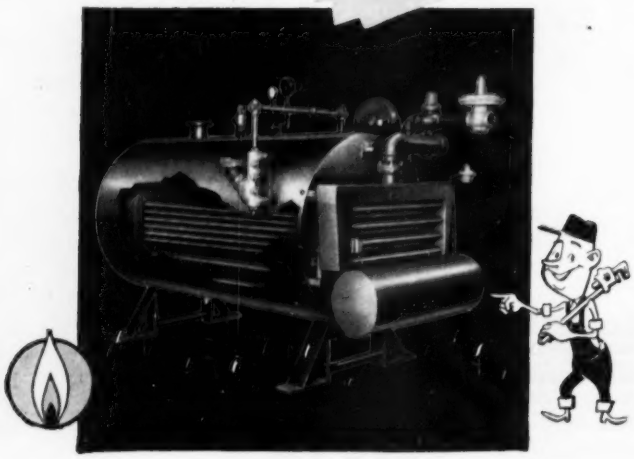


FOR BETTER PIPING . . .

USE ANACONDA® COPPER TUBES

Buy a Boiler You Can Understand

You don't need to be an Einstein or an atomic scientist to understand a Sellers Immersion Steam Boiler. The advantages of the Sellers immersion firing principle are apparent because it is based on practical engineering and common sense. Every pound of metal in a Sellers is strictly functional. Every tube and turn is designed and located for maximum efficiency and safety, for steam production at lowest cost!



IN A SELLERS:

1. **Firing tubes are completely submerged. All the heat goes directly into the water. Maximum heat transfer. No water line corrosion.**
2. **Water surface area is nearly three times that of a conventional boiler of comparable capacity.**
3. **There is no separate enclosed combustion chamber. No explosion hazard, no brick linings to replace, no carbon traps.**
4. **Expansion and contraction of firing tubes effectively combats scale.**

Sellers Immersion Steam Boilers are available in twelve sizes to meet all standard requirements. All are built to A.S.M.E. Power Codes. It will pay you to get the complete Sellers story. Write for bulletin No. 1206C-H5 today.

Sellers ENGINEERING CO.

4876 N. CLARK STREET CHICAGO, ILL.

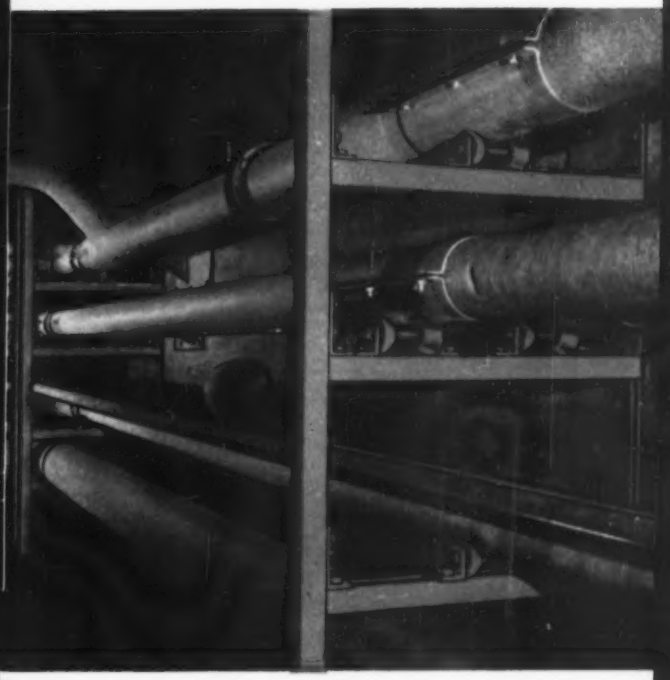
Blast Heaters • Immersion Automatic Water Heaters • Combustion Units • Industrial Gas Burners
Vertical Steam Boilers • Immersion Tank Heaters • Gas Combustion Equipment

install piping runs *with Versatile* UNISTRUT®

METAL FRAMING

The modern way to rack piping

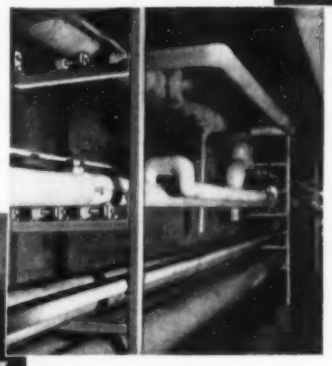
Tunnel job showing how UNISTRUT continuous run concrete inserts can be installed vertically or horizontally, or at any angle required.



UNISTRUT Products are Bonderized

Typical piping installation supported by UNISTRUT framing, concrete inserts and roller pipe supports. Slotted channel permits attachment of fittings at any desired point.

Note how UNISTRUT framework's great strength easily supports long runs of heavy piping, including bulky 16" chilled water lines.



Adjustable Framing System

assures exact pitch, permits changes or additions at any time—no special tools or equipment needed.

Conserves Steel, Reduces Manpower Hours, Cuts Over-all Costs

The UNISTRUT system of mechanical supports includes steel channel, roller pipe supports, concrete inserts, brackets, clamps, pipe hangers and many other standard parts which combine to form the world's most flexible system of support or suspension.

You save time in engineering detailing and eliminate the need for trained erection crews—you get fast, on-the-job framing assembly where adjustments are made and supporting members added as the work progresses. Try it on your next piping job!

Write for NEW Free 84-page Pocket Catalog No. 800!

U. S. Patent Numbers
2327587 2329815 2345650
2363382 2380379 2405631
2541908 Other Patents Pending

UNISTRUT®

The World's Most Flexible All-Purpose Metal Framing

For the Man on the Job!
84 pages packed with photos, drawings, ideas and data on how to frame, mount, rack, hang and support all kinds of mechanical and electrical equipment with adjustable UNISTRUT metal framing.

Distributors and Warehouse Stocks in Principal Cities. Consult your Telephone Directories.

UNISTRUT PRODUCTS COMPANY
1013 W. Washington Blvd., Chicago 7, Ill.
Dept. H5
Please send me a copy of the new UNISTRUT Pocket Catalog No. 800, without obligation.

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Company _____
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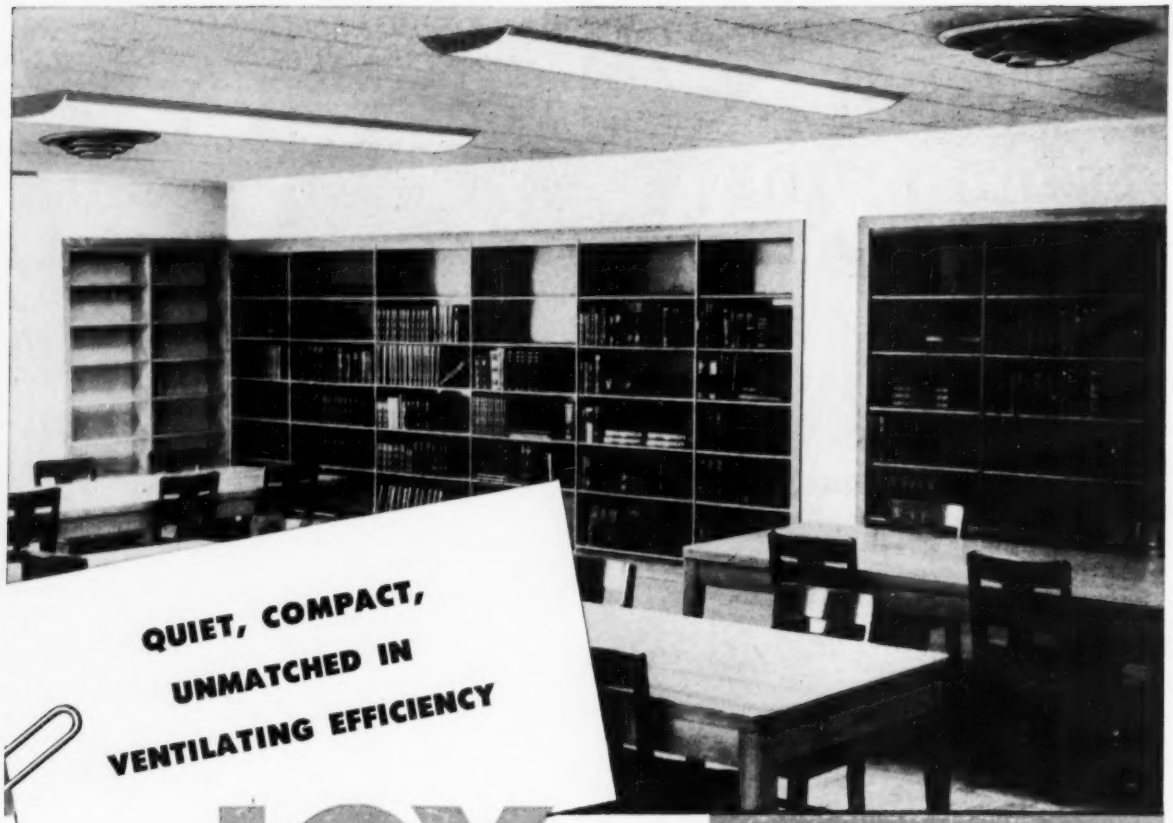
City _____ Zone _____ State _____

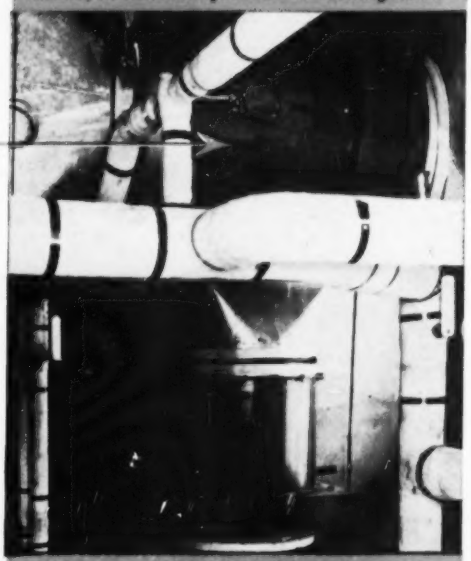


QUIET, COMPACT,
UNMATCHED IN
VENTILATING EFFICIENCY

JOY
AXIVANE® FANS
...BEST in Public Buildings

The compact, vaneaxial design of JOY AXIVANE Fans offers you important advantages of quiet, more efficient operation and savings on space requirements, installation costs, and power consumption. In addition, adjustable blades—a standard JOY feature—give you easy flexibility . . . you can make a simple on-the-job adjustment to meet new or changed conditions with greatest efficiency. ● For any ventilation job, check first with JOY—world's largest manufacturer of vaneaxial fans.

View in the Kansas Wesleyan Memorial Library, Salina, Kansas, ventilated with JOY Fans. Note ceiling louvers.



Wilson & Company, Engineers (Salina)—the consulting engineers—selected JOY Fans for this job. They mount right in the air duct, saving space and installation cost.

Write for Bulletin, or

Consult a Joy Engineer

W&D I 3520

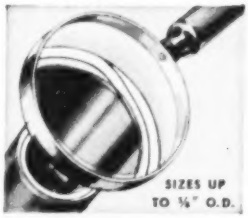
JOY MANUFACTURING COMPANY

GENERAL OFFICES: HENRY W. OLIVER BUILDING · PITTSBURGH 22, PA.

IN CANADA: JOY MANUFACTURING COMPANY (CANADA) LIMITED, GALT, ONTARIO

Extra-rugged, lightweight Bundyweld Tubing installs easily. Formed by one man, mounted by two, coils lie flat for quick, even plastering. Rough handling, accidental hammer blows don't dent or split tough Bundyweld.

Run your competition ragged . . . with Bundyweld Ceiling Radiant Heating



Key to Low Cost

Bundyweld is the only tubing double-walled from a single strip, copper-brazed through 360° of wall contact. It's leakproof, thinner-walled, yet stronger. It transmits heat quickly, has high bursting strength. It saves on material costs and installation time.

Standard 20' lengths of Bundyweld are easily formed into coils in shop or on job site. Expanded ends (furnished when specified) are quickly soldered into leakproof union. Joined, lightweight coils are easily mounted onto ceiling, quickly plastered over.

Now: best chance in years to run your competition ragged . . . and to *keep* that local lead for a long, long time.

How? Take on Bundyweld Ceiling Radiant Heating, the system that's made all others obsolete. Thousands of users know that it's free of drafts, dust, soot; that it's even-temperatured, noiseless in operation, economical from first to last; that it does away with space-robbing radiators and registers; that it postpones redecorating costs for *years*.

These enthusiastic users tell interested friends, who are among the millions reading Bundy ads in *Better Homes & Gardens, American Home* and *House Beautiful*. The story of dramatic, sound Bundyweld Ceiling Radiant Heating appeals to these prospects; they've flooded us with literature requests, asked for *names* of local plumbing and heating contractors who handle what they want.

You'll profit by being the first in your area to reach this mushrooming market. Why not send coupon today for *your* sales-building head start?

Radiant Heating Division

BUNDY TUBING COMPANY

Detroit 14, Michigan

SEND FOR FREE LITERATURE!

Bundyweld
Ceiling Radiant Heating

Radiant Heating Division, Dept. HP-553
Bundy Tubing Company, Detroit 14, Michigan

☐ Send free 20-page nontechnical brochure explaining Bundyweld Ceiling Radiant Heating.

☐ Send Bundy technical radiant heating pamphlet.

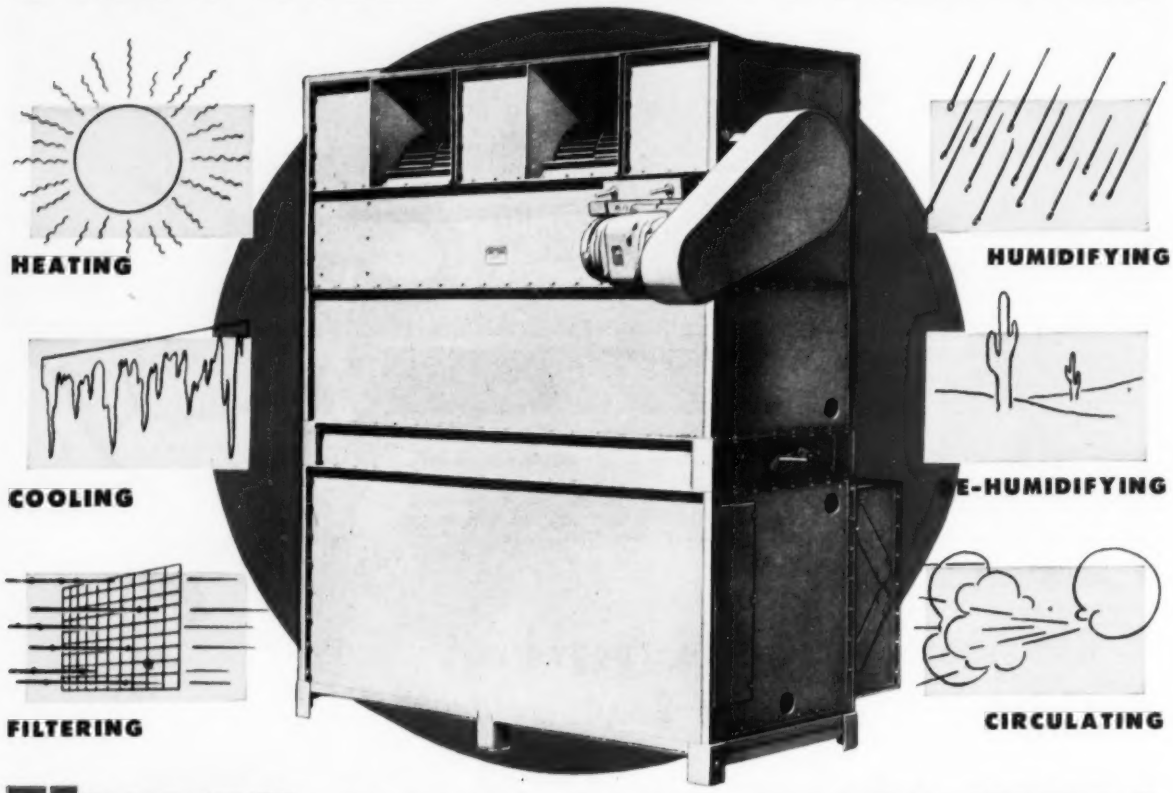
Name _____ Title _____

Company _____

Address _____

City _____ Zone ____ State _____

here's COMPLETE flexibility in UNIT AIR CONDITIONERS



YOUNG SECTIONAL "YAC" UNITS

FAN SECTION—Dynamically balanced multi-blade fan(s). Air discharge direction alterable.

HEATING COIL SECTION—With non-ferrous tube and fin coils available for hot water and steam.

DAMPER SECTION—Furnished with face or face and bypass dampers as required.

BASE & COOLING COIL SECTION—With serpentine or cleanable type water, or direct expansion coils.

FILTER SECTION—Incorporating either throw away or cleanable type filters.

MEET EVERY AIR CONDITIONING REQUIREMENT

Young sectional design air conditioning units enable you to offer year-around comfort. To meet specific requirements, "YAC" units are available in any combination from simple heating or cooling to complete air conditioning, including heating, humidifying, cooling, dehumidifying, filtering and circulating. "YAC" units are built in eight compact sizes, in either horizontal or vertical types, in capacities from 400 to 15,748 cfm. They can be installed either right or left hand. Young sectional design also permits greater ease in handling, installing and servicing. For further details or Catalog, see your nearest Young sales representative or write direct.

YOUNG

...AN "OLD" NAME IN HEAT TRANSFER ENGINEERING

YOUNG RADIATOR COMPANY

Dept. 513.E • Racine, Wisconsin • Factories at Racine, Wisconsin and Mattoon, Illinois

Sales and Engineering Offices in All Principal Cities

Yours for the asking—

TF TAYLOR FORGE
ON THIS SIDE – Data on the WeldELL line
TAYLOR FORGE ASA FORGED STEEL FLANGES
ON THIS SIDE
– Data on Taylor Forged Steel Flanges

A VOLUME OF DATA

. . . covering welding fittings and forged steel flanges . . .

ON A SINGLE SHEET

Here is just about the handiest tool ever devised for the pipe designer. Data on welding fittings and flanges that otherwise could be found only by plowing through many catalog pages and tables have been ingeniously condensed on the two sides of the durable letter-size card illustrated above.

One side covers the broad WeldELL line of Taylor Forge welding fittings. For every nominal pipe size, ½" through 30", it shows the wall thickness for every weight of every fitting in every available material. It also shows all required dimensions of all types of fittings.

The other side covers the world's most complete line of forged steel flanges. For every nominal pipe size, ½" through 24", it gives all essential dimensional and bolting data for all types of flanges in all weights. A particularly useful table (see reproduction) is that showing welding neck flange bores which enables you to determine the I.D. of any nominal pipe size without separate calculation. Thus the sheet gives you O.D. and I.D. of any weight of pipe.

The card is varnished to make it stand the steady usage you are certain to give it. To obtain your copy see your Taylor Forge distributor or **MAIL THE COUPON.**

TF

TAYLOR FORGE

TAYLOR FORGE & PIPE WORKS

General Offices and Works: P. O. Box 485, Chicago 90, Ill.
Offices in all principal cities.
Plants at: Carnegie, Pa.; Fontana, Calif.; Hamilton, Ont., Canada

Please send me one of your fitting and flange sheets:

NAME_____

POSITION_____

COMPANY_____

STREET ADDRESS_____

CITY_____ ZONE____ STATE_____

Mail to Taylor Forge & Pipe Works, P. O. Box 485, Chicago 90, Ill.

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KENNARD WATER SAVERS

Engineered

Announcing the latest addition to the .....

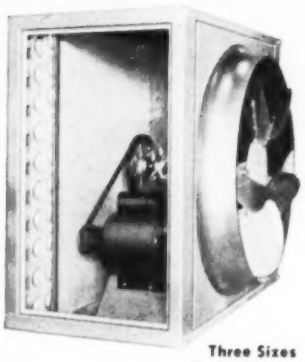
PACKAGED ECONOMY LINE

RESIDENTIAL—COMMERCIAL—INDUSTRIAL

AIR COOLED CONDENSER

Kennard planned for quiet operation; incorporating a specially designed air venturi, and a top quality five blade heavy duty fan.

Continuous capacity operation is assured by a generous coil surface and a long lived "V" belt drive.



Three Sizes
2, 3 and 5 Tons

TWO OTHER EFFICIENT

WATER SAVERS

TO SERVE YOUR PARTICULAR NEEDS

Five Sizes
3, 5, 8, 11 and 16 Tons

KT—COOLING TOWERS
EK—EVAPORATIVE CONDENSERS

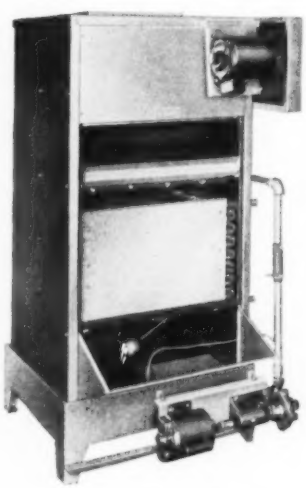
Kennard selected centrifugal type fans (Hot-Dip Galvanized) for quiet operation and for their ability to ***overcome duct resistance*** on indoor installations, and adverse wind effects on outdoor installations.

Completely galvanized cabinets, rugged enough for ***outdoor*** use, and completely coated on interior with an asphalt and asbestos fibre material for further rust-proofing.

Wetted Deck of the Cooling Tower is long lived clear heart of redwood.

The Evaporative Condenser has all prime surface copper coil.

For Air Conditioning Units and larger Water Savers, see the Kennard Representative, or write for special bulletins..



Five Sizes
3, 5, 7½, 10 and 15 Tons

Representatives in all principal cities

KENNARD CORPORATION • 1817 S. HANLEY ROAD
ST. LOUIS 17, MO., U.S.A.

WHY PAY FOR 1/6 H.P. WHEN YOU CAN DO A BETTER JOB WITH 1/12 H.P.

B & G BOOSTERS eliminate power waste — save space

In sizes ¾", 1" and 1¼", you'll find all the features which have made the B & G Booster the *preferred* heating pump... *but ingeniously engineered into more compact form!*

Their 1/12 H.P. motors, designed and built in the B & G plant, consume less power *but develop exactly the same pumping capacity as previous models with larger motors!*

This reduction in Booster sizes is in line with today's demand for space-saving equipment...makes these pumps ideal for residential installations and for zoned systems.

Regardless of size, all B & G Boosters are precision-built throughout. They operate with unbelievable quietness—an essential quality in forced hot water heating pumps. That's why they give genuine satisfaction through long years of trouble-free service.

LOOK INTO A B & G BOOSTER FOR THE REASONS WHY—

LEAK-PROOF SEAL

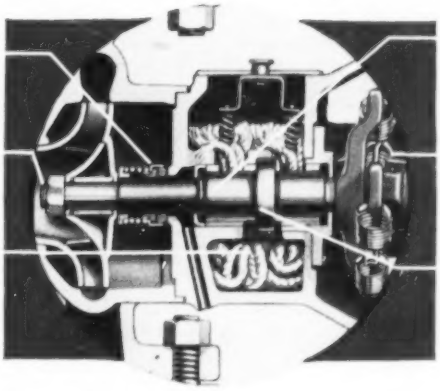
Water is positively prevented from leaking into the bearings by the precision-ground and time proven Seal.

IMPELLER

Not just a paddle wheel, but a true centrifugal design—dynamically balanced for smooth operation.

LUBRICATION SYSTEM

Unique in its failure-proof performance. Wool wicking transmits oil from the reservoir to the bearings—provides positive protection.



SHAFT AND BEARINGS

The shaft is hardened steel, machined to within .0005" limits and polished to a mirror finish. Bronze bearings match the shaft in quality—diamond bored and extra long for quiet, long-lived operation.

SPRING-TYPE COUPLER

This coupler provides a simple, dependable method of connecting motor and pump...contributes to quiet operation. It is safety-shielded.

THRUST COLLAR

Hardened to a high degree by special heat-treating to withstand the thrust wear which occurs in pump operation.

BELL & GOSSETT
COMPANY
Dept. CY-5, Morton Grove, Illinois
Canadian Licensee: S. A. Armstrong Ltd., 1400 O'Connor Drive, Toronto

Making water work harder

Water alone won't work—it takes *soap* to get Butch really clean!

As recently as a century ago, families made their own soap by boiling kitchen fats with lye they extracted from wood ashes. But since 1837 chemical discoveries as to the nature of fats, glycerin, and alkali have transformed soap-making from a household handicraft into a giant process industry. Today this industry is making water work harder than ever with new synthetic detergents of greater wetting and emulsifying power—even in hard water or acid solutions where soaps won't work.

As a matter of fact, 40% of the cleaning agents now in use are synthetic detergents. Over half of them are alkyl aryl sulfonates, known in practically every home in America by short trade names such as Fab*. They are made from a combination of sulphuric acid and benzene-like oils which is then neutralized to form the non-corrosive sulfonate. ALOYCO valves made of Aloyco 20 and Inconel are widely used by the three leading firms in the soap field, as well as by other processors of synthetic detergents to withstand the corrosiveness of the basic ingredients.

These harder working "soaps" represent only a small percentage of the many new end-products of modern chemistry that flow through ALOYCO corrosion-resistant valves during their processing. ALOYCO —in its engineering, its research and testing facilities, and in its manufacturing operations—has kept pace with the technical growth of the industries it serves. ALOYCO valves go hand-in-hand with chemical progress.

If your business involves chemical processing, the *Aloyco Corrosion Engineering Service* will be glad to assist you in selecting the proper valve and design for every corrosive service. Write to ALOYCO about your own valve needs. 3.13

Registered Trade Mark of Colgate-Palmolive-Peet Company

Longer Lasting
ALOYCO VALVES
1st in Corrosive Service

ALLOY STEEL PRODUCTS CO., INC.
1322 West Elizabeth Avenue, Linden, N. J.
Plants: Linden, N. J.; Bloomfield, N. J.; Elizabeth, N. J.

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nyb PROPELLER FANS

Propeller type ventilating fans deliver large volumes of air at low resistance and low current consumption. All wheels are machine balanced for smooth, vibrationless operation. Made in 2 types and 7 basic sizes to cover a wide range of industrial applications. Pressed steel panels provide rigid support and simplify installation. Totally enclosed motors mounted in heavy welded wire safety guard. Wheel diameters from 12 inch to 48 inch. Direct or belted drive. Capacities from 675 cfm to 23,500 cfm.

Penthouses for roof installation of ***nyb*** Propeller Fans can be furnished in 7 sizes. Louvers open and close automatically to protect fan against the weather. Separate louvers for wall mounting also available.

Write for Bulletins

nyb

IUHA HEAT WITH UNIT HEATERS

SEE OUR CATALOG IN SWEET'S

CERTIFIED RATINGS

All New York Blower Company products are laboratory tested, accurately rated and fully guaranteed in strict accordance with Standard Test Codes.

THE NEW YORK BLOWER COMPANY

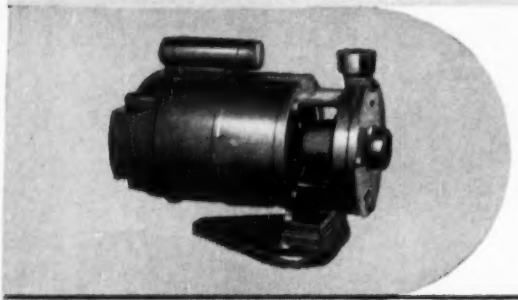
SALES OFFICES • 32nd STREET and SHIELDS AVENUE • CHICAGO 16

FACTORY, LAPORTE, INDIANA

ALLIS-CHALMERS
Air Conditioning
PUMPS

Easy-to-Install pumps

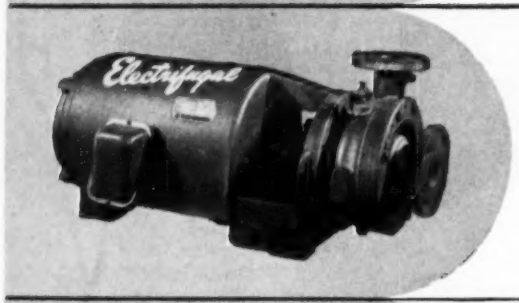
MEET 90% OF AIR CONDITIONING NEEDS



FHP pump

Up to 80 gpm, heads to 125 feet.

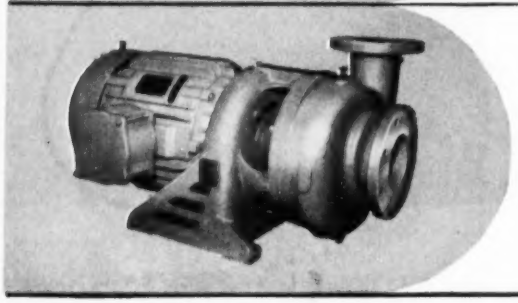
Compact pump and motor requires only two bolts for installation. Rigid construction holds alignment for longer bearing and seal life. Mechanical seal. Open impeller economy model does adequate job on many installations at very low cost. Closed impeller model for higher heads. Also available as frame-type pump for separate mounting.



Electrifugal pump

Up to 500 gpm, heads to 220 feet.

Only pump with unit-cast frame. Motor and pump are mounted on a single shaft in a one-piece rigid cast-iron frame. Alignment is rigidly held but there is plenty of space for maintenance. Installation requires only four bolts. Standard packing or mechanical seal available. Also built as frame-type pump for separate mounting.



Supporting adapter pump

Up to 2500 gpm, heads to 550 feet.

Flange motor and pump mounted on sturdy cast-iron supporting adapter. Motor and pump use same shaft. Rigidity assures vibrationless operation and long bearing life. Only four bolts required for installation. Available with standard packing or mechanical seal. Built in same ratings as frame-type pump for separate mounting.

FREE ENGINEERING HELP

YOUR ALLIS-CHALMERS PUMP REPRESENTATIVE is thoroughly familiar with pump problems in air conditioning equipment. He can offer you valuable suggestions in planning your equipment and installations. Call your Allis-Chalmers Authorized Distributor or District Office when you need help with your pump problems.

Write Allis-Chalmers, Milwaukee 1, Wisconsin, for centrifugal pump Bulletins 52B7529, 52B6140 and 52B6083 describing these air conditioning pumps.

A-3971

Electrifugal is an Allis-Chalmers trademark.

A-C ALLIS-CHALMERS

ALLIS-CHALMERS

Send for your new
EQUATEMP
FOLDER
ONE VALVE DOES TWO JOBS—
Shuts off. Controls Flow
EQUA TEMP
OFFERS EFFECTIVE FLOW CONTROL
PLUS COMPLETE SHUT-OFF
In One Low-Cost Balancing Valve For Hot Water Heating And Air Conditioning
Floor
Ceiling
Baseboard
Panel
Convector
Unit Air Conditioners
Unit Heaters
NO. 48 BY-PASS VALVE
Ideal companion for Equatemp on any type of Heating and Air Conditioning Unit where Manual control is desired. Also can be used separately from Equatemp.
(Details on back cover)
OHIO BRASS COMPANY • MANSFIELD, OHIO

To Save Fittings, Save Time, Save Space

When Equatemp® was introduced three years ago, it was intended primarily for use in hot water radiant heating systems. Radiant heating has proved to be the most important application. But ingenious architects and heating and ventilating engineers soon found additional uses for this versatile valve that both balances and shuts off. It saves installation time, reduces the number of fittings required, and can be installed in a small space. It has become popular on room-type units that can be used for either heating or cooling.

Ohio Brass engineers also have developed the new No. 48 Line By-Pass Valve. It can be used with Equatemp on room-type units. Or it can be used separately. The by-pass allows enough flow in winter to prevent freezing when the valve is closed. In the summer the by-pass can be closed to avoid danger of excess condensation.

The new Equatemp folder covers the additional applications for Equatemp and describes the new No. 48 valve. To get your free copy, just mail in the coupon below.

Ohio Brass

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BRONZE GLOBES • GATES • ANGLES
FOR INDUSTRIAL, DOMESTIC SERVICE

4376-V

Ohio Brass Company
Mansfield, Ohio

Please send me the new Equatemp folder, 1271-V.

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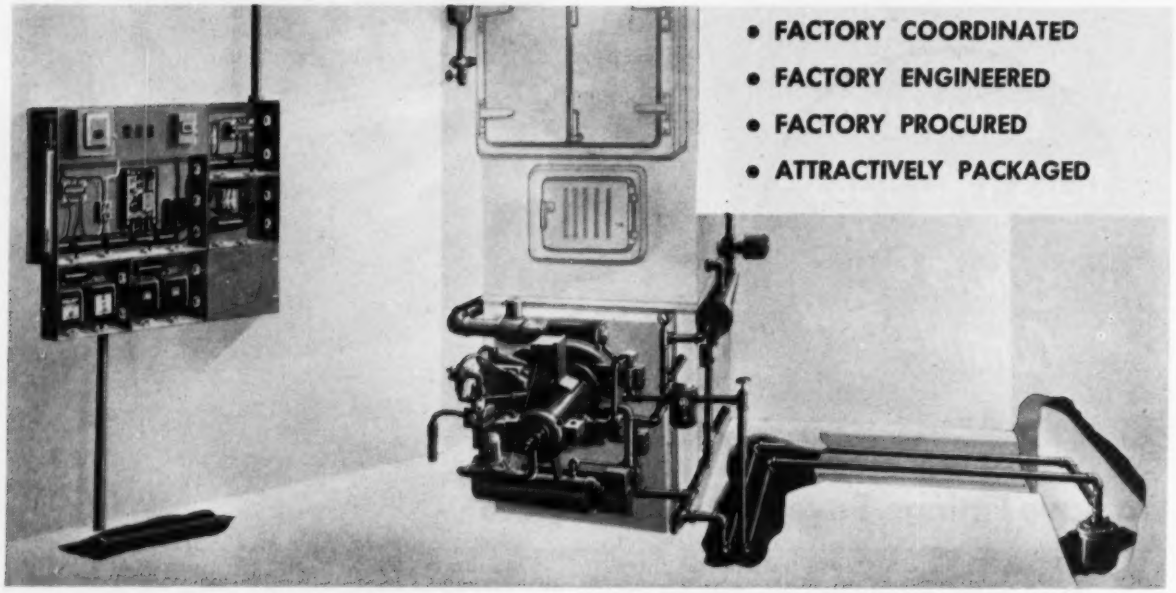
THE BIGGEST NEWS IN INDUSTRIAL HEATING SINCE THE INTRODUCTION OF PACKAGED STEAM GENERATORS

YORK-SHIPLEY Announces

INDUSTRIAL FUEL BURNING SYSTEMS



- FACTORY COORDINATED
- FACTORY ENGINEERED
- FACTORY PROCURED
- ATTRACTIVELY PACKAGED

- **YORK-SHIPLEY'S** new F/C Industrial Fuel Burning Systems are complete factory-engineered systems for burning light or heavy oil or for combination oil-gas firing.
- **F/C CONTROLS** are mounted in steel panel boxes and wired to terminal strips for quick connection on the job. The controls are available in various combinations to give the desired control.
- **F/C SYSTEMS** also include factory-engineered wind box assemblies and combustion refractory rings for faster mounting of burner and ignition assemblies. Accessory equipment is also included.
- **YORK-POWER** Horizontal Rotary Burner for light or heavy oil or combination firing is the heart of the F/C Systems and have many new features for more efficient operation.
- **F/C SYSTEMS** are designed basically for use with York-Power Burners but can be used with any type or make of industrial burner from 18 to 400 horsepower.
- **F/C SYSTEMS** are engineered and designed for quick application in the field and for automatic, efficient, economical operation of any boiler from 18 to 400 h.p.

WE CAN'T TELL THE WHOLE STORY HERE — SO SEND THIS COUPON TODAY FOR COMPLETE FACTS ON F/C FUEL BURNING SYSTEMS.

YORK-SHIPLEY, INC.
YORK 5, PA.

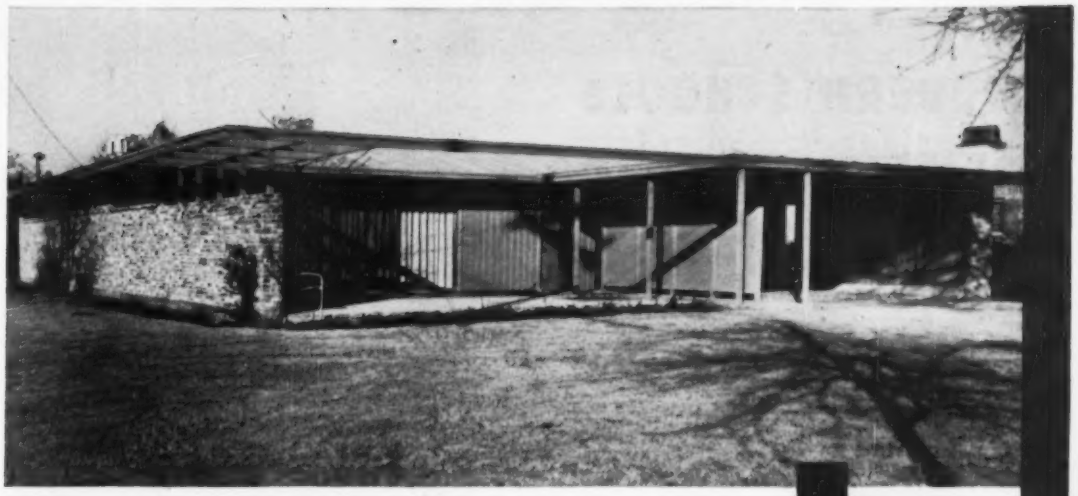
Please rush information on F/C Fuel Burning Systems.

Name _____

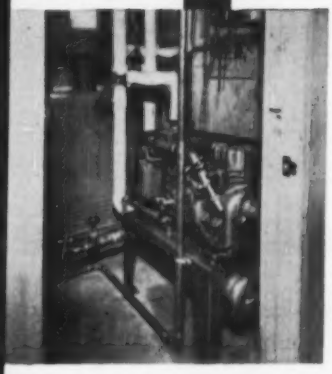
Company _____

Address _____

City _____ State _____



The new home of Herman Blum which received a second honorable mention from the Dallas Chapter of American Architects.



The Flow-Cold Liquid Chiller fits conveniently in a hall closet to provide a central cooling plant for the whole house.

Prize-Winning Home

healthfully air conditioned

by Acme FLOW-COLD®

A central air conditioning plant that fits snugly into a hall closet is just one of the many outstanding design features of this functional modern home located in Dallas, Texas. Selected for its compact size, quiet and efficient operation was the Acme Flow-Cold Packaged Liquid Chiller. Design conditions called for the unit to cool 15 GPM of water from 53 degrees to 45 degrees, thus handling a load of 5 tons. By keeping this 3-bedroom ranch type home comfortable in the hottest Texas weather, the Acme Flow-Cold has proved the wise choice of consulting engineer, Mr. Herman Blum, and the efficient installation of the Beard Plumbing Co.

The Flow-Cold Packaged Chiller was installed in conjunction with a hot water boiler and circulates chilled water in the summer and hot water in winter, with convectors in each room for year-round air conditioning. Versatile, easily installed and pre-tested at the factory, the Acme Flow-Cold can be used effectively by you in your next job — whether you are designing or building homes.

Write us today for more complete information.

ACME INDUSTRIES, INC.

JACKSON, MICHIGAN

Mfgs. of a complete line of Air Conditioning and Refrigeration Equipment

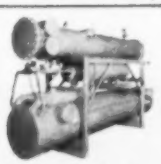
Evaporative Condensers
Cooling Towers
Floor-type Unit Coolers

Direct Expansion (Dry-Ex) and Flooded Liquid Chillers

Heat Exchangers, Oil Separators

Shell and Tube, Shell and Coil Condensers

Receivers, Pipe Coils



Packaged Liquid Chillers to 225 tons

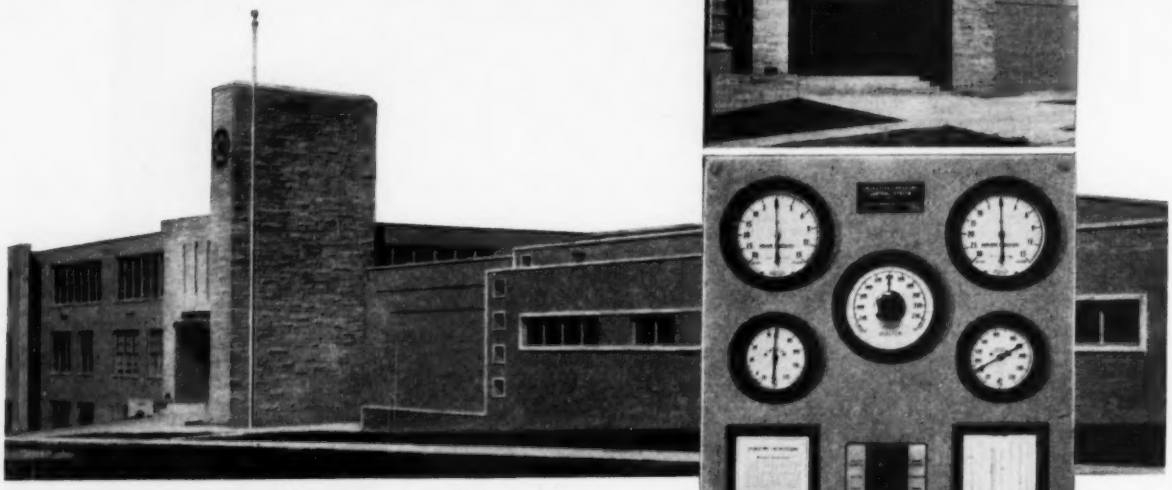
Flow-Temp Heat Pumps

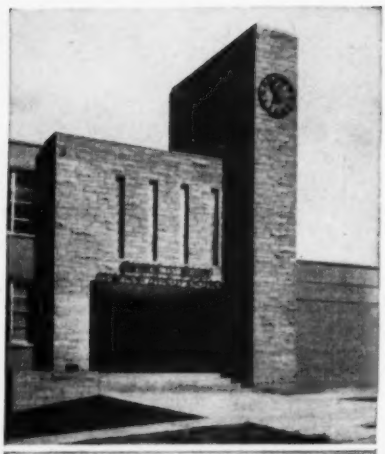
Flow-Cold Liquid Chillers

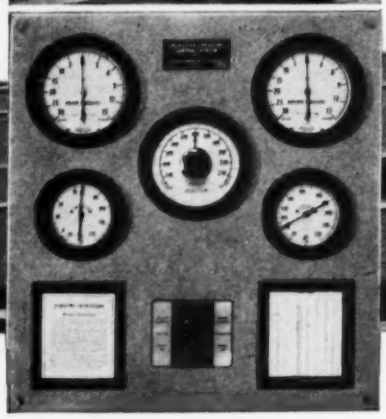
Remote Room Conditioner

Continuously serving the refrigeration and air conditioning industry since 1919

MODERN SCHOOLS DEMAND MODERN HEATING SYSTEMS







ELLIS JUNIOR HIGH SCHOOL, ELGIN, ILLINOIS
ELMER GYLLECK & ASSOCIATES, *Architects and Engineers, Elgin*
A. J. IRONSIDE, *Heating Contractor, Elgin*

This is the fourth Elgin school to enjoy the comfort, convenience, and economy of an

ILLINOIS High Vacuum Control System

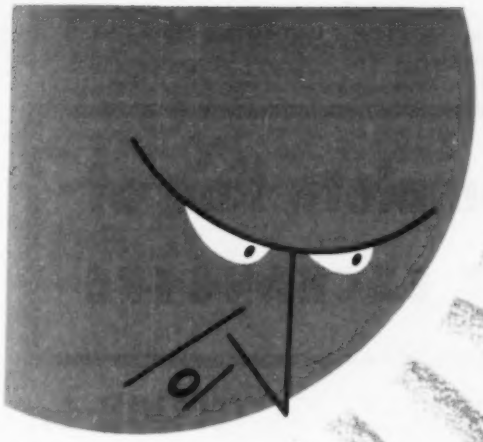
(Type "C" Generation Control)

Simplicity of operation is an outstanding feature. *The entire heating system is controlled at ONE POINT . . . the SELECTOR in the center of the control panel.*

Other Illinois heating systems include Type "A" Pneumatic and Type "R" Electric Zone Control as well as the standard vacuum and vapor systems.

WRITE FOR BULLETINS

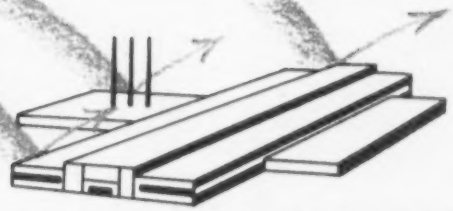
ILLINOIS ENGINEERING COMPANY
INCORPORATED 1900
RACINE AVENUE AT 21ST STREET • CHICAGO 8

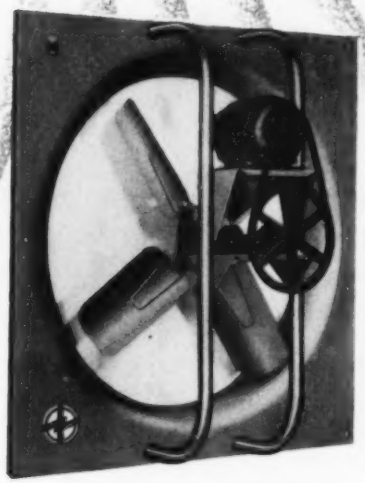


built to beat the summer heat in industrial plants . . .

Peerless FANS and BLOWERS

Certified Ratings





TYPE PVB INDUSTRIAL EXHAUST FAN
Belt drive unit. Fan diameters 24" to 48".

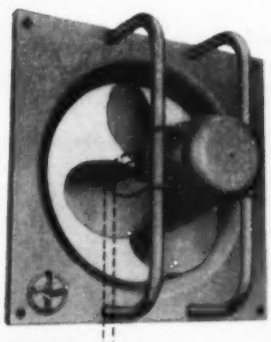
● **The Peerless line of Fans and Blowers** keeps factories, warehouses, shops or storerooms cool . . . even on hottest summer days. They are available now for immediate delivery . . . fans that will move from 4,000 to 21,000 C.F.M. . . . powered by ¼ to 1½ horsepower motors.

To be specific, Peerless PVB Exhaust Fans are ideal for use in factories and foundries and may be installed in duct installations. They are built for continuous duty . . . move dusty, dirt-laden, humid air out and cool air in.

The PVB series is rugged in construction . . . motors are ball bearing, totally enclosed. Fan shaft is supported by rigid enclosed ball bearing pillow blocks. These exceptional Peerless design features cut maintenance costs and reduce breakdowns.

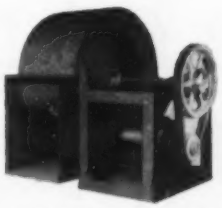
Peerless PVB Industrial Exhaust Fans are available for delivery now in all sizes. Like all Peerless products, they are fully guaranteed.

There is a Peerless Fan or Blower fitted for your needs. For full information call, write or wire the Peerless Electric Company today. There's still time for delivery before summer heat arrives.



TYPE PVS INDUSTRIAL EXHAUST FAN
Fan diameters 16" to 30". Controllers for 1, 2 and 3-speed operation.

DIRECT DRIVE UTILITY BLOWERS
For boiler rooms, restaurants, washrooms, etc. Arc-welded housings constructed of 16-gauge steel. Available in all types of current characteristics to suit all requirements.



BELT DRIVE UTILITY BLOWERS
Completely assembled with adjustable motor pulley for varying speeds. Housings can be tilted when exhaust angles are required. V-belt drives are selected with conservative ratings for long service.

PRESSURE BLOWERS
For small exhaust systems where air is laden with dust or grit, and for supplying high pressure air for conveying, cooling, etc. Self-cleaning blades. Heavy-gauge, arc-welded steel housings for rigidity and long life.

"SMOOTHEST PERFORMERS ON THE MARKET"

FAN AND BLOWER DIVISION

THE PEERLESS ELECTRIC COMPANY

1409 WEST MARKET ST. · WARREN, OHIO

Peerless Electric

Serving the Heating Industry since 1926

Yula ....a complete line of dependable HEAT EXCHANGERS

Yula-trol
Relay box and alarm

Get this vital DOUBLE* PROTECTION for your oil burner installations with...

Yula-trol AND *Yula* "YT" "U" TUBE

FUEL OIL DETECTOR — FUEL OIL HEATER

* **Protects system from serious damage, in case of oil leak in the Pre-heater, by shutting off oil burner, sounding an alarm, flashing on a red light.**
* **Acts as a Low Water Cut-off**

RESULT: Heating system protected at low cost

Yula "YT" "U" Tube Heater and Probe
Patented 2,610,267

Approved
by the New York City Board of Standards and Appeals No. 367-50-S.A.

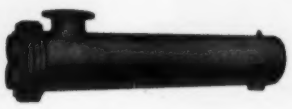
Like all Yula equipment, the Yula-trol and Yula "YT" "U" Tube Heaters provide the maximum in efficient, economical operation at lowest possible cost. Get Yula efficiency...get Yula "Double Protection".

TYPE "M" MIXING VALVE
Automatically mixes hot and cold water and other fluids. Delivers it at any predetermined constant temperature.

Other *Yula* Products

INSTANTANEOUS HEATERS

Ideal for domestic and industrial applications where large volumes of hot water or other solutions are needed for service water supply or process work.



CONVERTERS

. . . fully guaranteed. For water in tubes, steam in shell or water to water applications. "U" tube bundle construction simplifies cleaning.

DRY EXPANSION FREON COOLERS

. . . designed for air conditioning, refrigeration, industrial and process uses for cooling water or other liquids.

A. S. M. E. CONSTRUCTION

Yula carries a Complete Line. Yula's Engineering Staff is at your service.

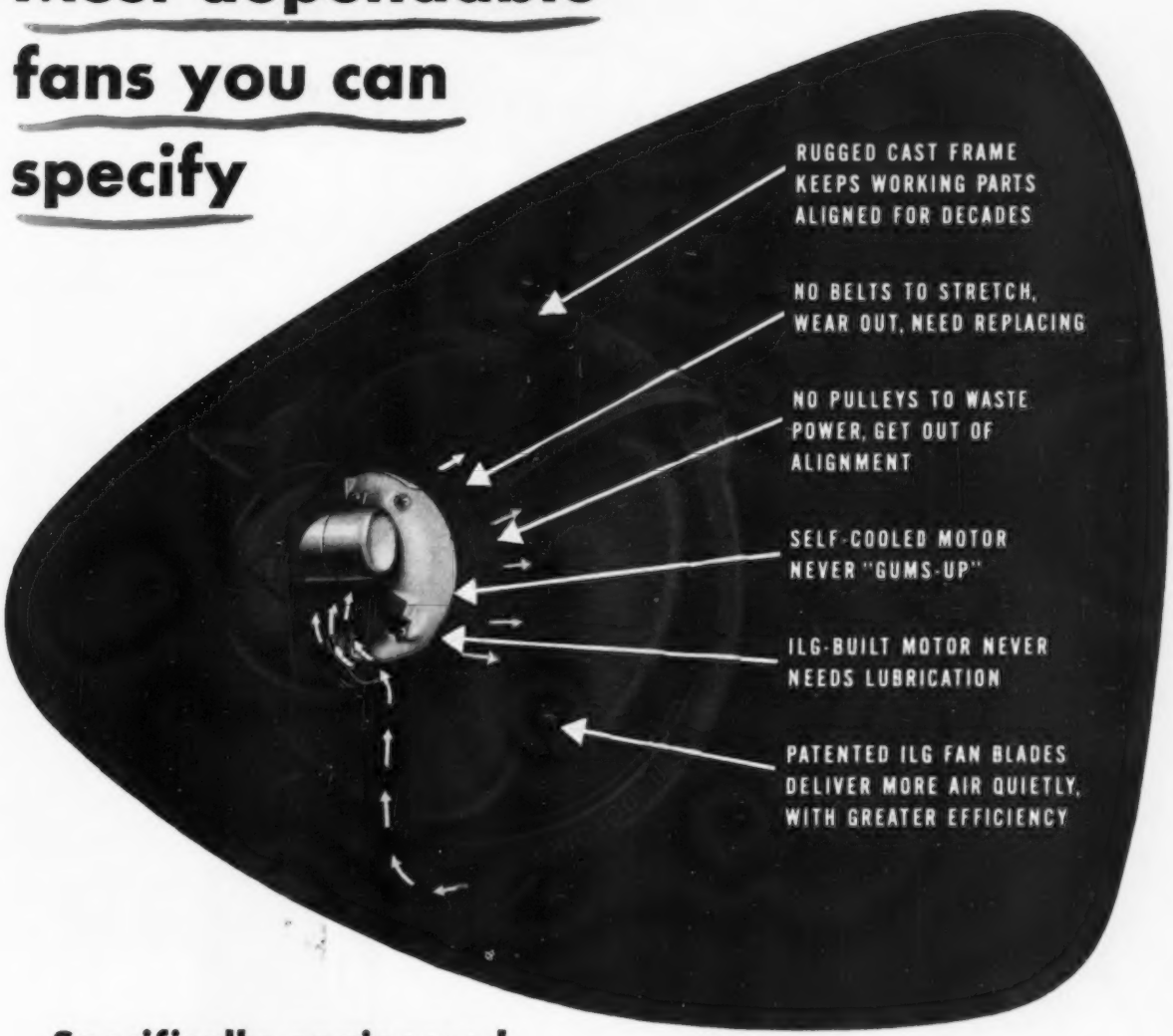
YULA WATER HEATERS, INC.

166 WEST 225th STREET, NEW YORK 63, N. Y.

MEMBER FUEL OIL AND WATER HEATER MANUFACTURERS ASSOCIATION

For complete information write Dept. HP

Most dependable fans you can specify


RUGGED CAST FRAME KEEPS WORKING PARTS ALIGNED FOR DECADES
NO BELTS TO STRETCH, WEAR OUT, NEED REPLACING
NO PULLEYS TO WASTE POWER, GET OUT OF ALIGNMENT
SELF-COOLED MOTOR NEVER "GUMS-UP"
ILG-BUILT MOTOR NEVER NEEDS LUBRICATION
PATENTED ILG FAN BLADES DELIVER MORE AIR QUIETLY, WITH GREATER EFFICIENCY

Specifically engineered for exhaust-fan duty!

• You've seen exhaust fans after they have been in service for a few months . . . how the grease, dust, steam, smoke, and fumes in the air stream form deposits on the motor. If motor is an open type, these deposits "gum-up" operation, interrupt service, shorten its life. If motor is fully enclosed, deposits form a blanket of insulation—the motor "runs hot." Recognizing these facts, ILG created the now internationally famous Self-Cooled Motor. When fan is operating, clean, cool, fresh air is drawn through the vent pipe from OUTSIDE, circulated through the motor, then exhausted from front of motor. Motor stays clean, cools itself—it is not affected by deposits on the cover—no foul air reaches it to cause trouble. Result—the most dependable fan you can specify. Send coupon, or phone nearby Branch Office (consult classified directory) for latest data and prices.

ILG REG. U. S. PAT. OFF. *knows ventilation!*

ILG ELECTRIC VENTILATING CO.
7741 North Crawford Ave., Chicago 41, Ill.
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Free! Engineering data Bulletin 150 contains all essential data—sizes, capacities, dimensions, ratings. Send coupon now.

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Individual _____ *Title* _____

Address _____

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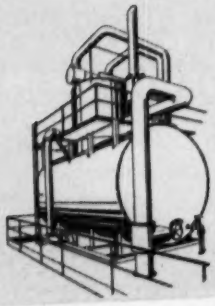
This **10,000** lb. per hour PACKAGED DEAERATING HEATER



has the same design and performance characteristics as this **1,000,000** lb. per hour central station heater

Unlike the central station plant, the small steam generating plant must often function with little operating attention. That is the very reason why this plant should insist on equipment that will give dependable, fool-proof, 24-hour-a-day service with a very minimum amount of maintenance attention.

A well-designed deaerating heater in this plant protects the boilers, feedwater heaters, and condensate return lines . . . it must indeed be a rugged, dependable watchdog.

That's why Graver designed the packaged deaerating heater with the *same* materials of construction . . . design features . . . construction methods . . . workmanship . . . accessories . . . and guarantees . . . that are built into heaters for the largest power generating stations of 1,000,000 lb. per hr. or more.

In addition, these Graver Heaters are *standardized* in design . . . they are pre-engineered for quicker shipment and for lower cost of installation; and they are furnished as *packaged* units, with all necessary parts and accessories for speedy, easy installation.

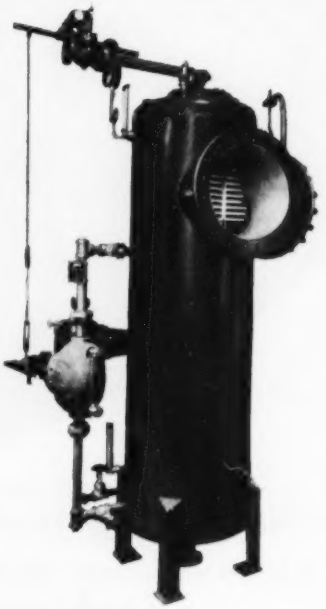
Write for descriptive brochure including dimensional and capacity data which will permit you to select the correct heater for your requirements.

GRAVER WATER CONDITIONING CO.

Division of Graver Tank & Mfg. Co., Inc.

Dept. HPA-PH 216 WEST 14th STREET, NEW YORK 11, N. Y.

In Canada: The Bird-Archer Co., Ltd., Cobourg, Ontario
In Mexico: Proveedores Tecnicos, S.A.; Puebla 259, Mexico 7, D. F.



FEATURES OF GRAVER PACKAGED DEAERATING HEATERS

Spray or Spray-Tray Design . . . as best suited for particular plant conditions

Corrosion-Resistant Construction . . . vent condenser, spray valves and tray cubes of stainless steel

Internal Vent Condenser . . . avoids tube bundle cleaning, reduces weight and headroom

Self-Adjusting Spray Valves . . . highest efficiency at all loads, accessible from exterior

Tray Cubes . . . rugged construction, light weight, convenient size

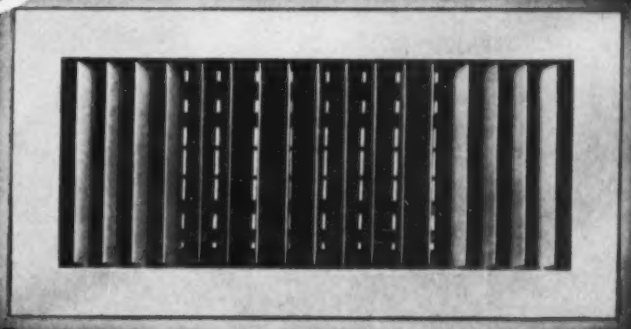
Built in both vertical and horizontal types for capacities up to 100,000 lb per hr.

GRAVER ***Deaerating Heaters***

GW 472

NEW ... with OPPOSED BLADE DAMPERS

SERIES 277



4 WAY Airfoil REGISTER

Series 277 combines 4-way directional grille with opposed blade damper. This provides both maximum directional control and positive volume control. Opposed blade dampers supply uniform distribution of air over entire grille face.

LATEST AND FINEST PRODUCT OF TITUS ENGINEERING. It stands out... by any comparison ... in its *beauty, rugged design... superior diffusion performance.*

FRAMES ... Heavy gauge cold-rolled steel. One piece.

BORDER ... 1¼" beveled edge.

LOUVERS ... Streamlined. Smooth as glass. Solid section.

LOUVER DEPTH ... ¾". Assures positive air deflection.

SCREW HOLES ... Countersunk for No. 6 screws. Spaced ½" on center from outer edge of border.

FINISH ... Gray lacquer primer as standard. Other finishes available at slight extra cost.

GASKET ... ¼" sponge rubber.

ADJUSTMENT ... Individual louver adjustment for front and center set of louvers. Opposed acting damper blades in rear are key operated.

• BRAND NEW 1953 CATALOG. Simplifies specifying. Provides all engineering data you need.

REQUEST YOUR FREE COPY NOW, including all specification and engineering data plus facts on construction, performance and selection of outlets.

CHECK TYPE OF GRILLE ON WHICH INFORMATION IS DESIRED

- ☐ Air conditioning outlets
- ☐ Return air grilles and registers
- ☐ Volume controllers
- ☐ Perforated metal and ornamental grilles
- ☐ Door ventilators
- ☐ Special made-to-order grilles

TITUS MANUFACTURING CORP., WATERLOO, IOWA

- ☐ RUSH information on Series 277.
- ☐ Send complete New 1953 catalog.
- ☐ Send literature on above checked items.

NAME_____

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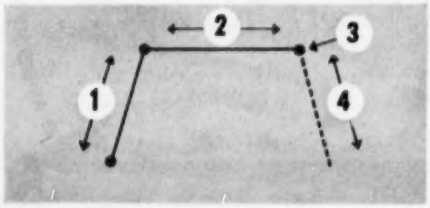
If You're Batch-Cooking You Can Use This Inexpensive Control

Here is a recorder-controller planned especially for economically controlling processes like batch cooking. The Gotham Elapsed Time Recorder-Controller does the essential control jobs easily and accurately. First of all, it brings the batch up to maximum holding temperature fast. It holds the batch at that temperature for a predetermined period. It shuts down the process at the end of the cooking period. Those are its three standard functions. Automatic venting or cooling functions can be added. Also available with a pressure, instead of temperature, system.

Write for full information about the Elapsed Time Recorder-Controller and other Gotham Controllers. They're in Catalog 500.



This Is What the Gotham Elapsed Time Recorder-Controller Does

1. Brings controlled variable (temperature or pressure) up to maximum fast.
2. Holds variable at maximum for predetermined period.
3. Shuts down process.
4. Automatic venting or cooling can be added.

Gotham Elapsed Time Recorder-Controller

SPECIFICATIONS

CHART SIZE: 12"

CASE: Standard - black crinkle; smooth black or white may be obtained.

ACTUATION: Vapor, Gas or Mercury for temperature. Pressure elements available.

CHART DRIVE: Spring wound or synchronous motor.

CONTROL SYSTEM: Pilot relay with adjustable sensitivity for 0 to 30% throttling band is standard, two position or 100% throttling band available.

HOLDING PERIOD: Standard 0 to 3 hrs. Other periods available.

Keep Everything Under Control With Gotham

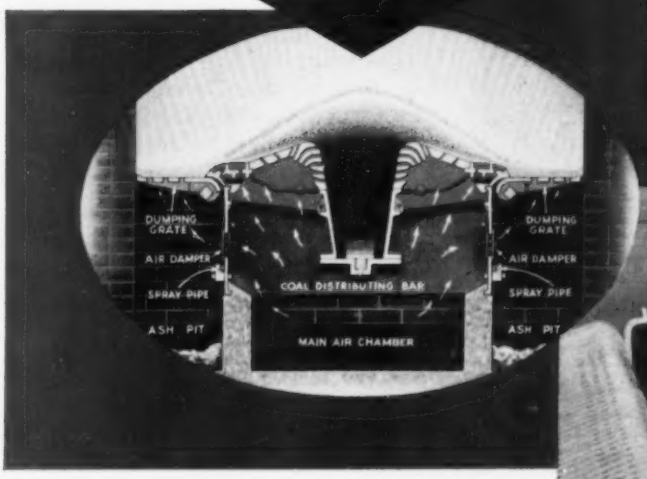
GOTHAM INSTRUMENTS

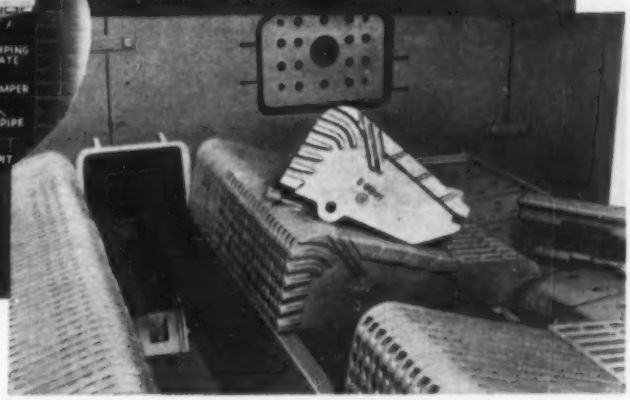
Division of AMERICAN MACHINE AND METALS, INC.

Dept. B, 233 Broadway, New York 12, New York

IT'S NEW HI-TUYERE

AN IMPROVEMENT FOR DETROIT LOSTOKERS (OLD OR NEW)





MORE AIR — Supplies more air toward the center of the retort, greatly increasing the coal burning capacity.

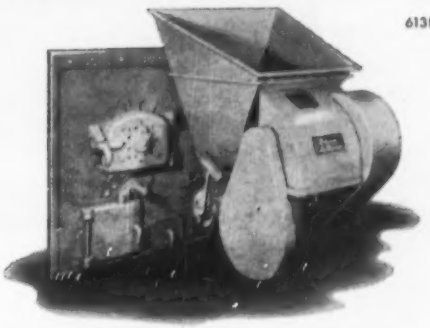
REDUCED COKING TENDENCY — This results in more uniform porosity of the fuel bed.

INCREASED EFFICIENCY — Provides better air penetration of the fuel.

LONGER LIFE — Increased cooling area due to greater depth of tuyere.

Hi-Tuyere is available in complete sets for your present stoker and is standard design for all new LoStokers.

6138

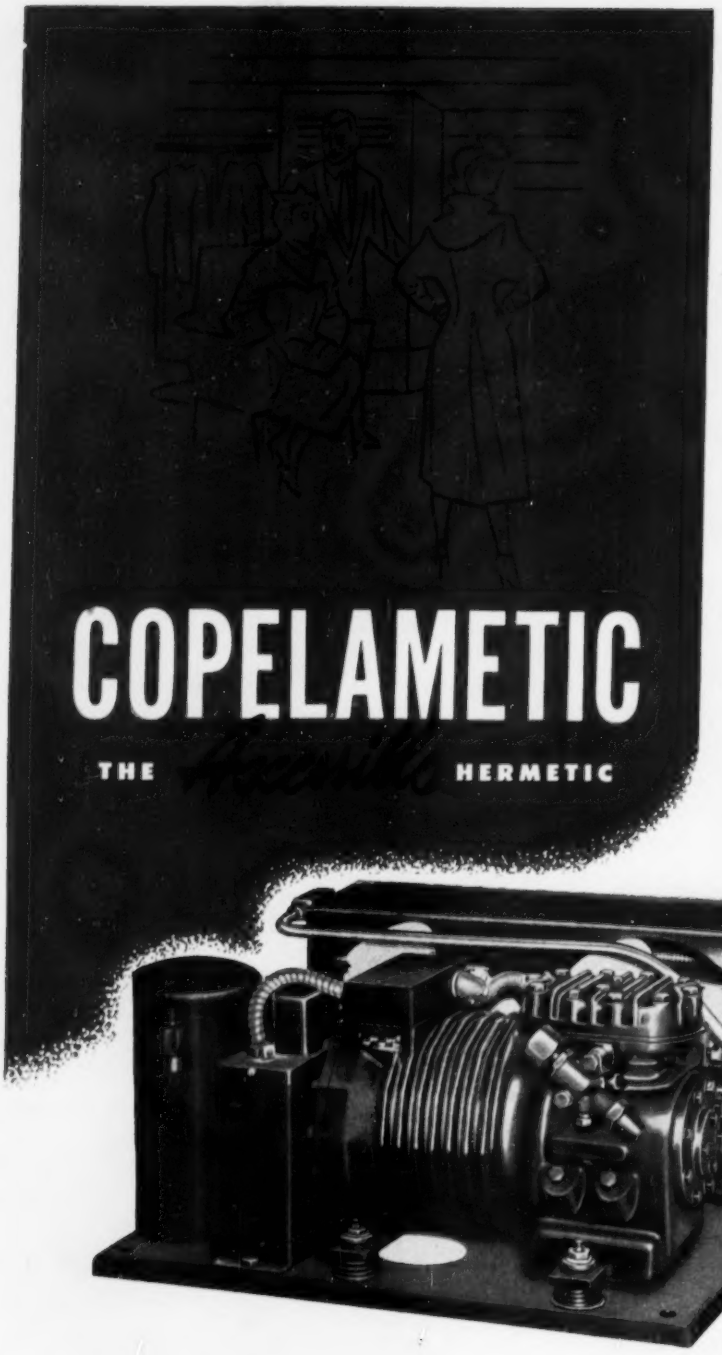


Detroit LoStokers now have Detroit Adjustable Feed Coal Feed Controls by which coal and air may be automatically varied to suit the load.

DETROIT STOKER COMPANY

GENERAL MOTORS BUILDING, DETROIT 2, MICHIGAN

Works at Monroe, Michigan • District Offices in Principal Cities



COPELAMETIC

THE HERMETIC

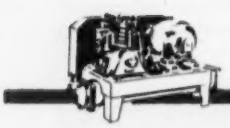
compact . . .
dependable . . .
quiet . . .

Compact . . . dependable . . . quiet. Those are the prime requirements for the refrigeration unit in any air conditioning system. Add to them ruggedness, accessibility and long life and you have the COPELAMETIC.

For the unit that has everything, look to Copeland the pioneer. Practical-minded engineers designed this modern unit without belts, seals or manual oiling, and to top that they made it accessible for servicing on the spot. Specify COPELAMETIC and be sure of a satisfied client for years to come.

There's a Copeland unit for every type air conditioning installation from smallest to largest. Air-cooled, remote COPELAMETICS are made from ¼ thru 3 HP. There are water-cooled, remote units from ⅓ thru 7-½ HP. Self-contained COPELAMETICS are available for all applications. For complete details, write us or call your refrigeration dealer.

MODEL DE-100 ILLUSTRATED



REFRIGERATION UNITS (OPEN TYPE AND COPELAMETIC) WATER COOLERS

Copeland
DEPENDABLE *Electric* REFRIGERATION

COPELAND REFRIGERATION CORPORATION • SIDNEY, OHIO

INTRODUCING . . . the new member of the Dravo Space Heater family

DRAVO GAS-FIRED

Suspended Type

UNIT HEATER

—for heating and ventilating commercial and industrial buildings

—for process drying

Now . . . Dravo Corporation offers you the new Dravo Gas-Fired Unit Heater, ideal for installations requiring a heating output of 68,000 to 172,000 Btu. This new addition, joining the Dravo *Counterflo* Space Heater models, makes available a range of Dravo Heaters from 68,000 to 2,000,000 Btu.

ENGINEERED DESIGN

The Dravo Gas-Fired Unit Heater is ruggedly constructed with a cast iron heat exchanger, cast iron burners and a heavy-gauge steel exterior jacket with baked enamel finish . . . all designed for years of satisfactory service.

EASY INSTALLATION

The Dravo Gas-Fired Unit Heater is delivered completely assembled. Installation requires only hooking up gas connection and exhaust stack. Units are wall-hung or suspended from roof trusses to conserve valuable floor space.

DESIGNED FOR SAFETY

Dravo Gas-Fired Unit Heaters are approved by American Gas Association and listed by Underwriters' Laboratories, Inc. Safety pilot turns off gas automatically if the pilot light goes out or burns too low for perfect ignition. The cast iron heat exchanger and combustion chamber withstand corrosion and will not burn out.

EFFICIENT OPERATION

The Dravo Gas-Fired Unit Heater has a minimum heating efficiency of 80%. The draft hood prevents down drafts, absorbs all excessive chimney action and conserves heat. The heater delivers the exact amount of heat where you want it . . . when you want it. Automatic thermostat controls are available if desired.

AVAILABLE NOW

Units are available in a variety of sizes from 68,000 to 172,000 Btu, equipped with a fan or blower. Blower models are recommended for installations requiring heated air at greater velocity or against greater static pressure.

WRITE FOR INFORMATION

Get the complete details now describing the new Dravo Gas-Fired Unit Heater. Use the coupon.

DRAVO
CORPORATION

PITTSBURGH • ATLANTA • BOSTON • CHICAGO • CINCINNATI
CLEVELAND • DETROIT • INDIANAPOLIS • NEW YORK
ST. LOUIS • PHILADELPHIA • WASHINGTON

Sales Representatives in Principal Cities

Dravo Corporation, Heating Department
Fifth and Liberty Avenues, Pittsburgh 22, Penna.

☐ I want complete information on the new Dravo Gas-Fired Unit Heater. ☐ Please send me Bulletin No. OP543-021

☐ Please have a representative call.

Name_____

Title_____

Company_____

Address_____

City_____ Zone____ State____

HERE'S HOW PROCESSING LINES ARE *Fortified* AGAINST VALVE TROUBLES

CASH STANDARD *Streamlined* PRESSURE REDUCING VALVES TYPE 1000

Look at the Streamlined flow pattern directly above. It results because of the Streamlined form of the inner valve. On your lines it means smooth, dependable valve action day after day through years of service without attention. Proof of this is in what so many users say . . . "put the '1000' on the line and forget it."

When you put this Streamlined construction on your lines you have no complicated parts to get out of order, no small ports or passages to clog up. There are no close fits. It's straight line flow all the way — flow that gives you maximum capacity, close delivery pressure control, and tight closures — flow that saves you money all along the line — flow that means elimination of failures — speedier production and no spoilage.

WRITE FOR BULLETIN 962

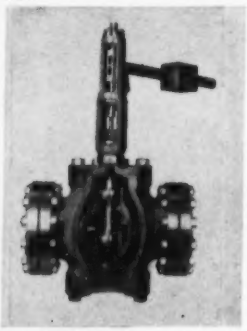
CASH STANDARD CONTROLS.. VALVES

A. W. CASH COMPANY
DECATUR, ILLINOIS

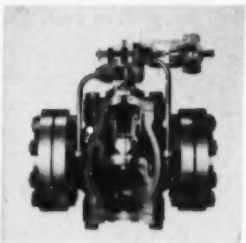
BULLETINS AVAILABLE ON OTHER CASH STANDARD VALVES

Send for them

BULLETIN 950—features the CASH STANDARD Type D Single Seat pressure Reducing and Regulating Valves for use with most fluids. Shows simple inner working parts that save in maintenance. Diagram explains how valve works. Blueprint shows simplicity of installation.



BULLETIN 965—features the CASH STANDARD "42" Series—a complete line of balanced lever valves for handling almost anything that will flow through a pipe except some injurious chemicals. Two full pages show 16 installations with descriptions.



BULLETIN 967—features the CASH STANDARD Tye II Condenser Water Regulator — self-contained — pilot-operated for controlling the flow of cooling water to condenser coils. Used with water or air —with any gas or oil that is non-corrosive—and with all refrigerating fluids. Blueprints show installation at outlet of condenser and at inlet. Capacity charts are shown.

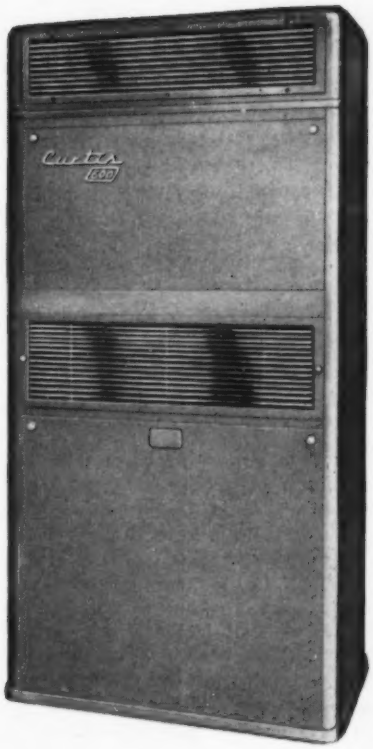
YOU PROFIT BY

Curtis EXPERIENCE

in 15 years

of Packaged Air Conditioning Pioneering

One of the First in the Industry



Curtis units that were installed back in the days when packaged air conditioning was a novelty are still giving faultless service. Today's Curtis packaged units are better than ever . . . perfected by 15 years of experience.

YOU'LL SELL more packaged units when you sell these Curtis advantages:

- Long life, slow speed operation
- Quiet and dependable
- 5 year warranty
- Easy installation
- Attractive, modern appearance
- Complete range of sizes — 2, 3, 5, 7½, 10 and 15 tons

Nationally Advertised in THE SATURDAY EVENING POST, TIME and NEWSWEEK.

For Full Information
MAIL THIS COUPON WITH YOUR LETTERHEAD

CURTIS REFRIGERATING MACHINE DIVISION
of Curtis Manufacturing Company (Since 1854)
1950 Kienlen Avenue • St. Louis 20, Mo.

746

CURTIS REFRIGERATING MACHINE DIVISION
of Curtis Manufacturing Company
1950 Kienlen Avenue, St. Louis 20, Missouri

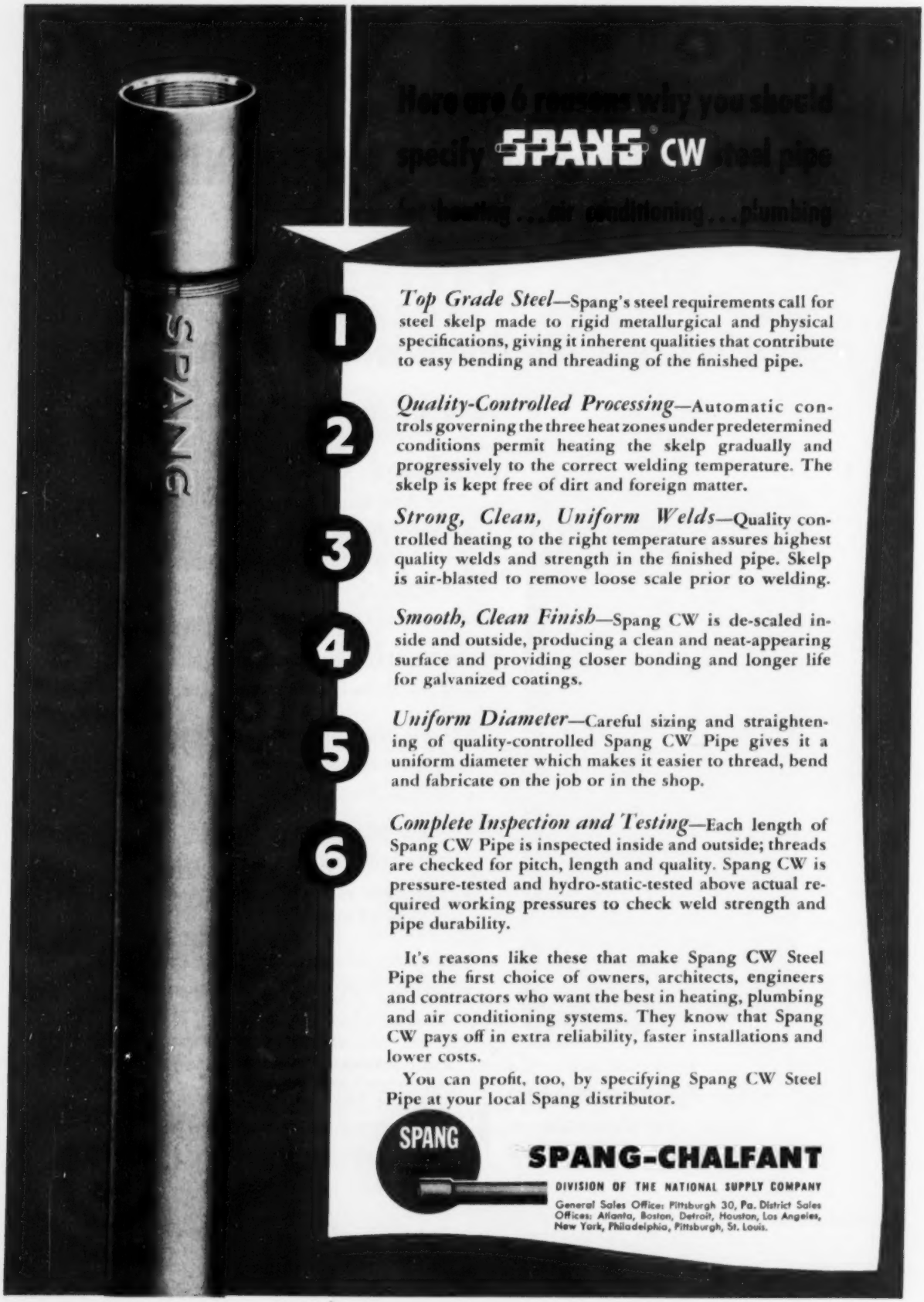
I am interested in direct factory franchise. Send complete details.

Company Name.....

Street.....

City..... Zone..... State.....

Signed.....



Here are 6 reasons why you should specify SPANG® CW steel pipe for heating . . . air conditioning . . . plumbing

1 *Top Grade Steel*—Spang's steel requirements call for steel skelp made to rigid metallurgical and physical specifications, giving it inherent qualities that contribute to easy bending and threading of the finished pipe.

2 *Quality-Controlled Processing*—Automatic controls governing the three heat zones under predetermined conditions permit heating the skelp gradually and progressively to the correct welding temperature. The skelp is kept free of dirt and foreign matter.

3 *Strong, Clean, Uniform Welds*—Quality controlled heating to the right temperature assures highest quality welds and strength in the finished pipe. Skelp is air-blasted to remove loose scale prior to welding.

4 *Smooth, Clean Finish*—Spang CW is de-scaled inside and outside, producing a clean and neat-appearing surface and providing closer bonding and longer life for galvanized coatings.

5 *Uniform Diameter*—Careful sizing and straightening of quality-controlled Spang CW Pipe gives it a uniform diameter which makes it easier to thread, bend and fabricate on the job or in the shop.

6 *Complete Inspection and Testing*—Each length of Spang CW Pipe is inspected inside and outside; threads are checked for pitch, length and quality. Spang CW is pressure-tested and hydro-static-tested above actual required working pressures to check weld strength and pipe durability.

It's reasons like these that make Spang CW Steel Pipe the first choice of owners, architects, engineers and contractors who want the best in heating, plumbing and air conditioning systems. They know that Spang CW pays off in extra reliability, faster installations and lower costs.

You can profit, too, by specifying Spang CW Steel Pipe at your local Spang distributor.

SPANG

SPANG-CHALFANT

DIVISION OF THE NATIONAL SUPPLY COMPANY

General Sales Office: Pittsburgh 30, Pa. District Sales Offices: Atlanta, Boston, Detroit, Houston, Los Angeles, New York, Philadelphia, Pittsburgh, St. Louis.

NOW! A BRAND-NEW BULLETIN SHOWING the COST-CUTTING FEATURES of the FAMOUS EconoTHERM Boiler

Read about a *modern* boiler — *streamlined* to present-day engineering standards — and built by an old, experienced firm with new ideas!

See all the advantages of the EconoTherm's *exclusive* off-center firing fully described!

Check over each up-to-the-minute fact on EconoTherm's top-quality features.

INDUCED MECHANICAL DRAFT • ROTARY COMBUSTION • FULLY AUTOMATIC OPERATION • MODERN WELDED BOILER SHELL • STAINLESS STEEL AIR RING • GAS, HEAVY OIL, LIGHT OIL FIRING • COMPLETELY "PACKAGED" DESIGN

Then see *how* these features combine to give you *everything you're looking for in a long-lived, efficient steam generator!*

GET YOUR COPY NOW!
Write for EconoTherm
Bulletin EC-52 G

CHECK FIRST with Dutton

Dutton **BOILERS**

DIVISION HAPMAN-DUTTON COMPANY

KALAMAZOO, MICHIGAN • BOILER BUILDERS SINCE 1880

FOUR TYPES — SIZES FROM 5 to 250 h.p.

The York High-Velocity System permits each room occupant to control climate and was installed with the minimum amount of dislocation to the normal running operations of the hotel.

The Netherland-Plaza Can Help Solve Your Air Conditioning Problems

Fifteen years of York performance in the public rooms of this world-famous hotel led to the recent selection of York equipment to air condition 14 complete floors of guest rooms.

York had the precise system for this important job because York has taken the compromise out of air conditioning. You need not put up with forcing a system to fit your building, or changing the building to fit a system.

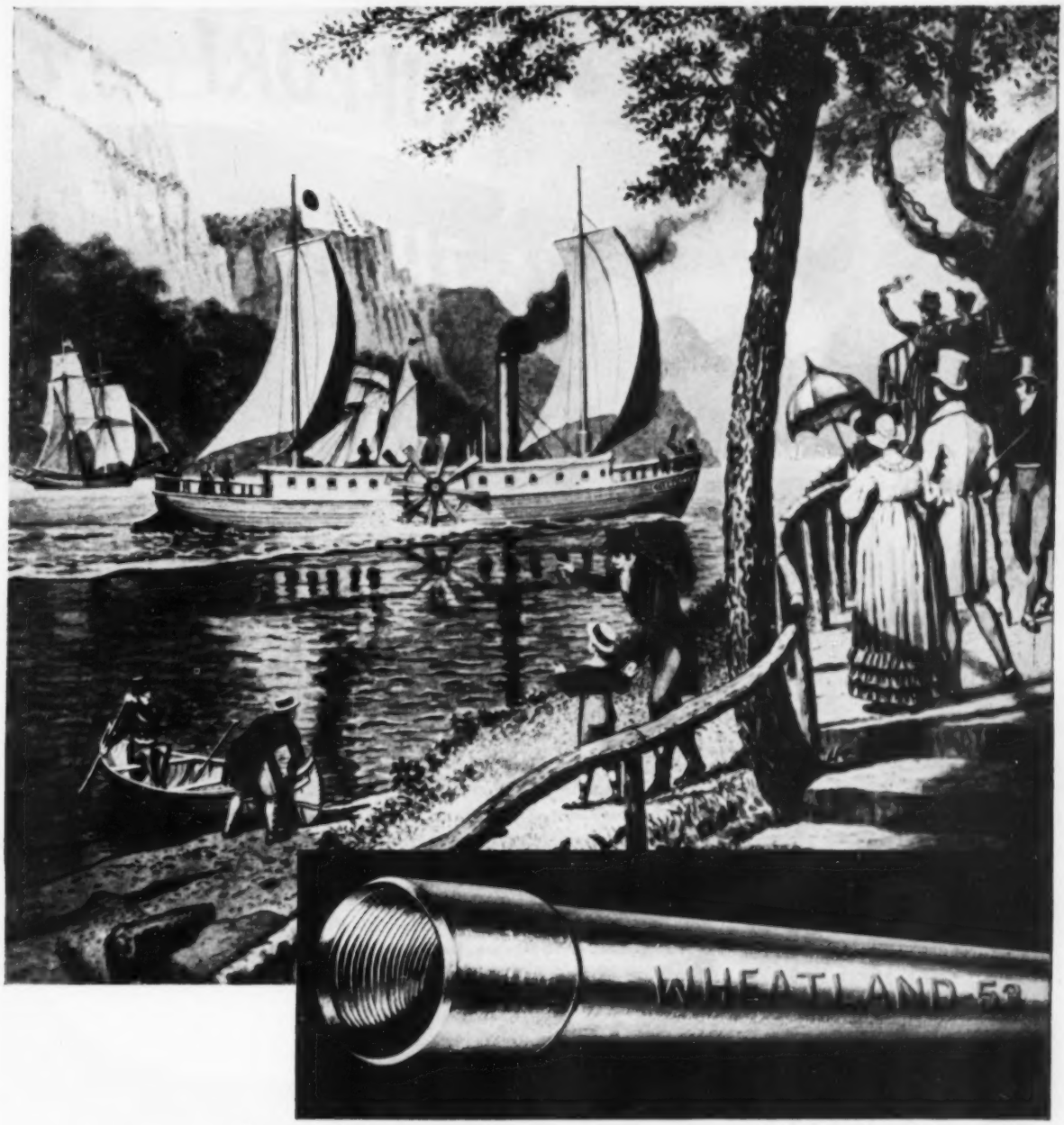
Working with the industry's *widest range* of equipment, York Engineers can recommend the precise system, or combination of systems, that give better performance, longer life . . . usually at lower initial investments and operating costs.

Your nearby York Engineering Office will be happy to work with you. It will save you time, money and worry to put your air conditioning problems in the capable hands of York Engineers. The number is in your Classified Telephone Directory. Or write to York Corporation, York, Pennsylvania.

• • •

York Certified Maintenance. York assumes the responsibility of keeping York equipment in first-rate condition under the economical York Certified Maintenance Plan. For a known-in-advance charge, equipment is checked regularly, reports and recommendations submitted in writing; necessary repairs made with genuine York parts.

YORK AIR CONDITIONING AND REFRIGERATION
HEADQUARTERS FOR MECHANICAL COOLING SINCE 1885



PIPE WITH THE YEARMARK

IMPORTANT DATES IN HISTORY

When Robert Fulton's "Clermont" first appeared on the Hudson River in 1807, she was looked upon as a miracle of engineering. Today, America is still in the fore with the most modern ocean liner.

The same skill, enterprise and devotion to perfection can still be found at Wheatland's, where every pipe carries its date of production to give assurance of the latest improvements. Ask for Wheatland "the pipe with the yearmark".

WHEATLAND TUBE COMPANY

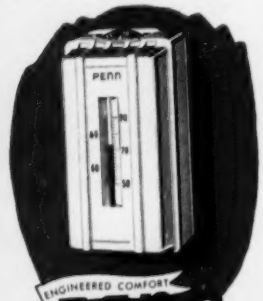
Bankers Securities Building, Juniper & Walnut Streets, Philadelphia 7, Pa.

You've put up with it, too... coaxing an outmoded heating system all winter long in a vain attempt to get the *steady, even* warmth you need. And during the changeable Spring season, it's worse than ever!

Right now . . . this Spring . . . is get-ready time for next heating season. See your local dealer. Ask him to show you how a *modern* automatic heating system controlled by the *modern* PENN *heat-anticipating* room thermostat stops Hot-n-Cold living. Here's a thermostat that "anticipates" temperature changes *before* your body feels them. Then it "commands" the burner to supply the right amount of heat to *maintain* the temperature level you select for *real heating comfort.*

On your heating system, *be sure* you get PENN Controls and you'll *be sure* of lasting comfort! Remember, PENN costs no more.

Penn Controls, Inc., Goshen, Indiana



PENN
AUTOMATIC CONTROLS

Selected by leading manufacturers for over 30 years

FOR HEATING, REFRIGERATION, AIR CONDITIONING PUMPS, AIR COMPRESSORS, ENGINES, GAS APPLIANCES

SUPPORT LIKE THIS...

helps *you* sell BETTER HEAT

"Right now . . . this Spring . . . is get-ready time for next heating season. See your local dealer."

That's what this action-compelling, timely PENN advertisement is telling and urging your heating prospects to do! Take advantage of this extra sales help. See your prospects now . . . tell them how old-fashioned HOT-n-COLD living is an experience of the past when their heating system is controlled by the famous PENN heat-anticipating thermostat. Use the PENN consumer literature to clinch the sale. Write today for a FREE supply of sales aids.

Remember . . . any type of heating system is better, gives greater comfort when it is equipped with PENN heating controls. **Penn Controls, Inc., Goshen, Indiana.** Export Division: 13 E. 40th Street, New York 16, N. Y., U.S.A. In Canada: Penn Controls Limited, Toronto, Ontario.

As advertised in the May issue of AMERICAN HOME . . . the June issue of BETTER HOMES & GARDENS and the May 18, issue of NEWSWEEK

PENN AUTOMATIC CONTROLS

FOR HEATING, REFRIGERATION, AIR CONDITIONING, GAS APPLIANCES, PUMPS, AIR COMPRESSORS, ENGINES

Engineered for tough service

THIS TUBE-TURN Welding Neck Flange will contain greater pressures under temperature extremes, and will last longer than other types under repeated bending or vibrations of piping. It is *engineered* for tough service . . . with a long, tapered hub, and a smooth transition in thickness to the pipe-end bevel.

You can select the exact Welding Flanges you require from TUBE TURN's complete line: welding neck; slip-on; lap joint; socket welding; blind; orifice; or pipeline non-standard flanges. It *pays to specify* TUBE-TURN Welding Fittings and Flanges. Call your nearby TUBE TURNS' Distributor . . . you'll find one in every principal city.

Be sure you see the double "tt"

TUBE TURNS, INC. LOUISVILLE 1, KENTUCKY

DISTRICT OFFICES: New York • Philadelphia • Pittsburgh • Chicago • Houston • Tulsa • San Francisco • Los Angeles • Denver • Atlanta

Subsidiaries: TUBE TURNS OF CANADA LIMITED, CHATHAM, ONTARIO • PENNSYLVANIA FORGE CORPORATION, PHILADELPHIA, PA.

ENGINEERING SERVICE

TUBE TURNS' *Engineering Service* HELPS DEVELOP NEW PIPING TECHNIQUE

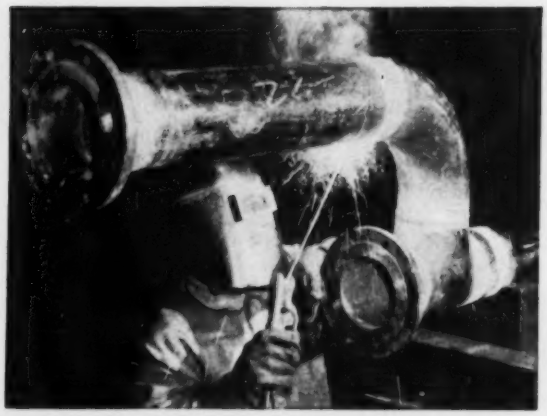
D. R. Cheyney, of TUBE TURNS' Engineering Service Division, has had wide experience in alloy and non-ferrous applications.

THIS STORY of how a large processor saved $50,000 and conserved scarce copper with a new approach to a piping application shows why TUBE TURNS, INC. is so highly regarded as an authority on piping engineering.

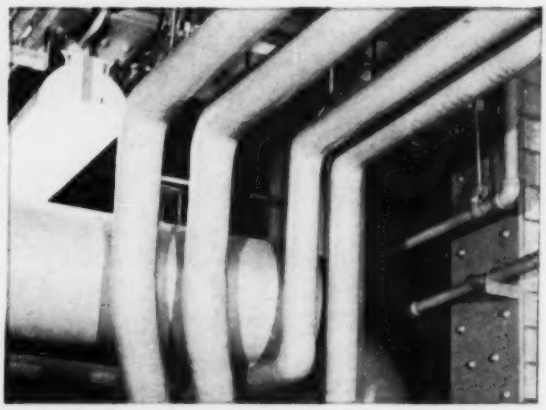
The problem involved the retubing of seven cooling units, formerly fabricated from copper tubing and fittings. Aluminum was considered as a replacement; however, there were no satisfactory methods for welding thin-walled aluminum tubing to welding fittings. TUBE TURNS' Engineering Service Division, working with Alcoa, came up with the solution. A new brazing technique was developed, and special TUBE-TURN Welding Returns, and TUBE-TURN Welding Elbows were supplied.

TUBE TURNS' Engineering Service is ready to help *you* in such special applications.

TUBE-TURN aluminum long-radius Welding Returns being brazed to aluminum tubing, in fabrication of cooling coils.



SPEEDS FABRICATION—TUBE-TURN Welding Fittings have won a reputation for dimensional accuracy that pays off in fast, easy alignment and fabrication. Time often is saved by welding assemblies in the shop, quickly tying them into the job.



SPACE SAVER—Welded piping makes a compact, neat installation—and requires no maintenance. Streamlined, its insulation is more easily applied.

Want Dimension Data?

TUBE TURNS, Inc. has compiled a handy folder of charts covering dimensions and weights of TUBE-TURN Welding Fittings and Flanges. If you'd like a free copy just send this coupon.

TUBE TURNS, INC., Dept. A-5
224 East Broadway, Louisville 1, Kentucky

Your name .....

Position .....

Company .....

Nature of Business .....

Address .....

City ..... *State* .....

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"TUBE-TURN" and "TUBE-TURN" Reg. U. S. Pat. Off.

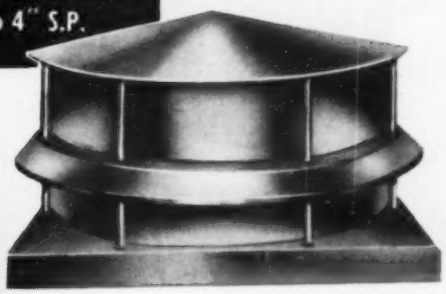
TUBE TURNS, INC.

LOUISVILLE 1, KENTUCKY

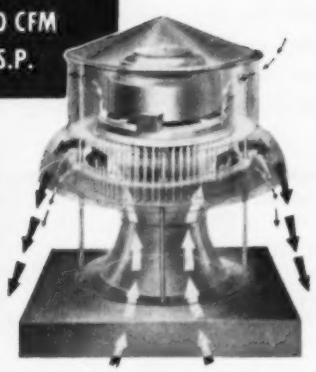
You can be sure GALLAHER *CERTIFIED* RATINGS mean PEAK PERFORMANCE

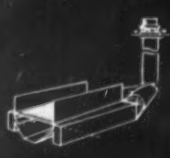
Here's Why

NEW Belt Drive 4000 to 65,000 CFM up to 4" S.P.



Direct Drive 100 to 11,000 CFM up to 4.2" S.P.





Gallaher ratings are the result of actual physical tests of the entire unit — *not* a fan wheel alone or other component, *not* interpolations of free air data, but a true picture of the unit as it operates under actual conditions.

Any other method of rating a power roof exhauster will be inaccurate. Gallaher research has shown conclusively that the errors may run as high as 50% when ratings are mere theoretical calculations.

Gallaher units with patented, built-in *scroll effect* are the only power roof exhausters which can develop high static pressures necessary for performance. They have been rated in an independent laboratory under the direction of a nationally recognized authority under the conditions prescribed by NAFM and ASH&VE.

Before you buy power roof exhausters we think you'll agree that these three questions should be answered to your satisfaction. 1. How were the tests conducted? 2. Did it include the whole unit and not a component? 3. What impartial authority conducted the tests? We think that you'll buy Gallaher Air-Vans.

The GALLAHER Company

4108 DODGE STREET OMAHA, NEBRASKA

GENTLEMEN:

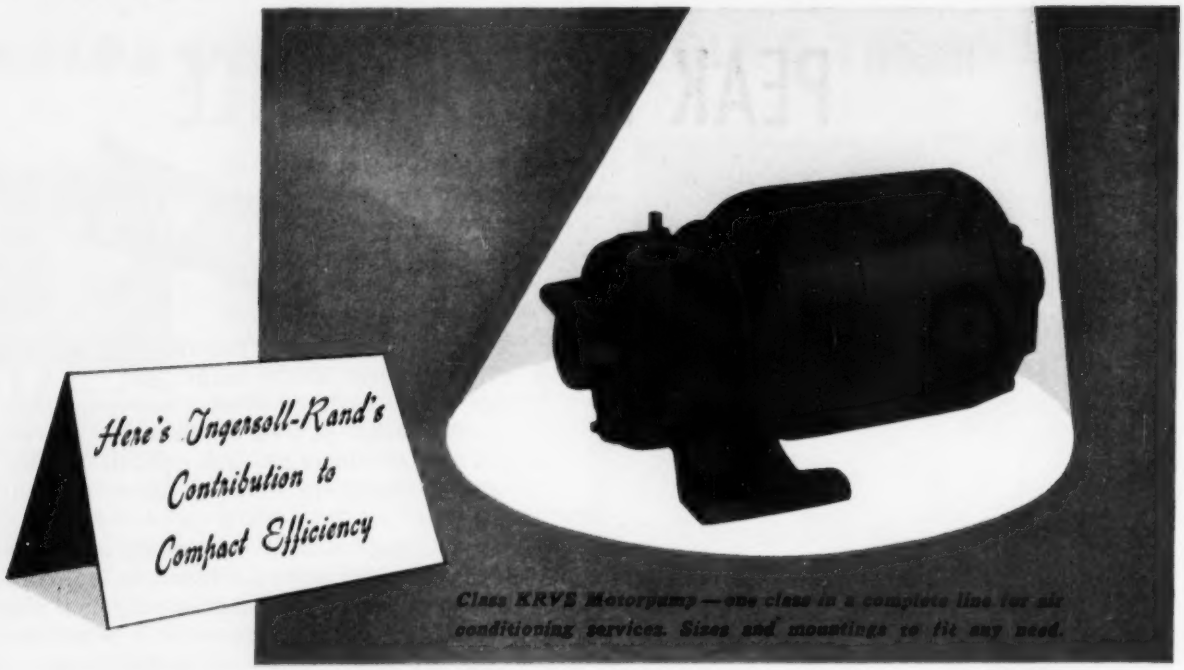
Send me full information on Gallaher Power Roof Exhausters.

NAME _____

ADDRESS _____

CITY _____ STATE _____

SMALLER UNITS and PUMPS



Class KRVE Motorpump—one class in a complete line for air conditioning services. Sizes and mountings to fit any need.

the New emphasis in Air Conditioning

Everywhere the emphasis is on compact efficiency for air conditioning units and pumps. Take a peek at the plans on the tables of Design Engineers working on new models. You'll find that in drawing after drawing, units and pumps are getting smaller and more compact than ever before!

The I-R Motorpump brings future pump design to you now. And it's now, today, that you can get all the advantages of future design benefits! Here are a few of these advantages:

● *SIZE FOR SIZE—the I-R Motorpump will outperform any pump now available for air conditioning service.* ● *SPACE SAVING—The compactness of the I-R Motorpump will make you wonder why it couldn't have been designed years ago!* ● *EASY INSTALLATION—Operates equally well in any position. Easily bolted to floor, wall, or equipment. No special foundations needed.* ● *LONG, TROUBLE-FREE SERVICE—Put in these rugged pumps and forget them!* ● *LOW FIRST COST—Use a smaller, more efficient I-R Motorpump to do the job of a larger regular pump.*

For complete details write for Bulletin 7177 or call the nearest Ingersoll-Rand branch office.

AVAILABLE NOW FOR RUSH DELIVERY

Ingersoll-Rand MOTORPUMPS for Improved Air Conditioning Operation

Ingersoll-Rand

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COMPARE

any other automatic, self-cleaning air filter, with CONTINENTAL!

You will then be convinced that Continental Automatic, Self-Cleaning Air Filters are unexcelled in engineering and construction. You will then fully appreciate Continental's three exclusive advantages! So . . compare . . and learn why Continental provides unequalled air-filtering performance.

Compare Air Flow

In Continental Air Filters, the filter cells move up and across top of filter. Cells are free to rotate around an axis like the cars on a ferris wheel (see cutaway drawing). As cells, holding their vertical position, pass from front to back curtain, *there is no reversal of air flow* through the filter media. Result: in Continentals, dirt is *never* blown back into the clean-air stream.

Compare Self-Cleaning Action

As each cell, in Continental Air Filters, moves down into the cleaning oil, it is stopped and held in a semi-horizontal position (see cutaway drawing) until the accumulated dust is *soaked loose*. The cell then drops quickly into a vertical position. This action causes a surge of oil to pass through the filter media, *counter-air flow*. Result: In Continentals, a thoroughly self-cleaned filter.

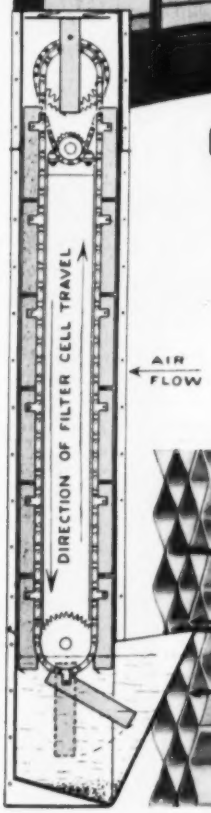
Compare Air Filter Media

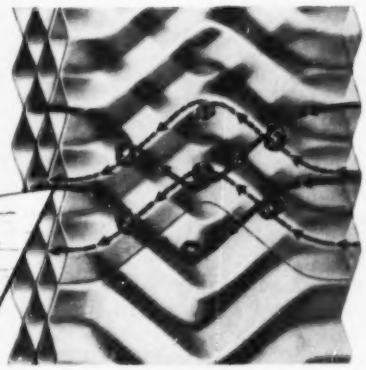
The Continental Air Filter media has honeycomb openings with large, non-clogging air passages (see sectional drawing). Result: Low resistance and unequalled efficiency in over-all performance.

Before you specify or buy, write us for this technical data booklet. It's just off the press . . and will help you compare. Use the coupon below. No obligation.

CONTINENTAL automatic

- *non-clogging*
- *self-cleaning*
- *non-reversing*
- *space-saving*
- *any capacity*





CONTINENTAL

P. O. BOX 1647 LOUISVILLE 1, KY.

CONTINENTAL AIR FILTERS Inc.

GENTLEMEN: Please send the following:
- ☐ New Bulletin No. 401-A
- ☐ Sample of E • Z • Wash Air Filter Media

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FIRM _____

STREET _____

CITY _____ STATE _____

When you figure the pipe you can be sure—

if it's National

● A lot of people have faced a lot of piping problems over the last 60 years. During that time, so many of them have solved their requirements with one pipe—NATIONAL Steel Pipe—that they have made NATIONAL the largest selling pipe in the world.

Other things have helped too . . . the fact that one integrated organization has complete control of U·S·S NATIONAL Steel Pipe production, from the raw material to the finished product . . . the fact that advanced steel-making facilities and special pipe manufacturing processes are here combined with the experience of thousands of skilled craftsmen to produce steel pipe of uniformly high quality and utmost dependability.

As a result, when you decide on NATIONAL Steel Pipe you can be sure you'll always get pipe whose metallic structure, strength, sound joints, superior cutting, bending and threading properties assure easy installation and long, trouble-free performance.

These are the reasons why "old timers" swear by NATIONAL Steel Pipe and why NATIONAL is being consistently specified by the new generation of architects, engineers and contractors. In turn they have found that for low cost, easy installation and *proved* reliability in service, no other pipe quite fills the bill like NATIONAL.

So when you need an all-purpose steel pipe . . . make it NATIONAL.

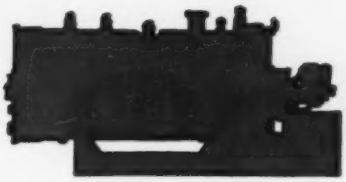
NATIONAL TUBE DIVISION, UNITED STATES STEEL CORPORATION
PITTSBURGH, PA.

COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO, PACIFIC COAST DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

U·S·S NATIONAL Steel PIPE

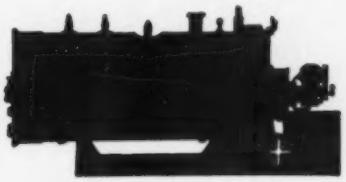
UNITED STATES STEEL

HOW SUPERIOR SOLVES YOUR STEAM PROBLEMS



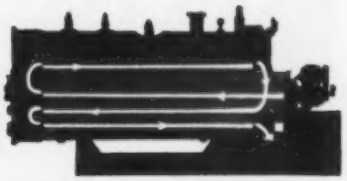
A COMPLETE PACKAGE

Completely factory-assembled and tested, a Superior Steam Generator is backed by undivided responsibility.



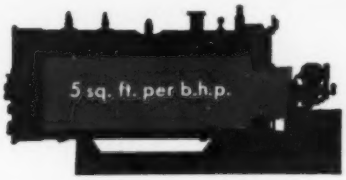
INDUCED DRAFT THAT'S BUILT-IN

... eliminates need of an expensive chimney ... Multiple fans draw evenly on all tubes, reducing maintenance.



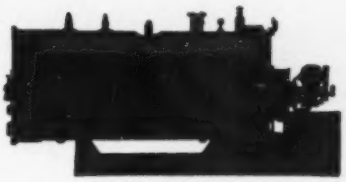
4-PASS, DOWN-DRAFT DESIGN

High gas velocities produce high efficiency. Down-draft design promotes rapid evaporation, quicker steaming.



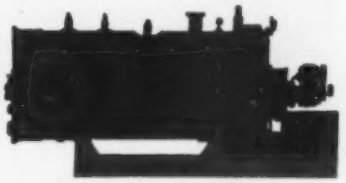
AMPLE HEATING SURFACE

A minimum of 5 sq. ft. of heating surface per boiler horsepower assures maximum efficiency at full rated capacity.



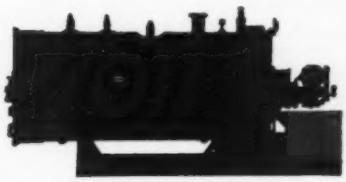
RESERVE CAPACITY

Greater steam space and large evaporating surface provide ample reserve capacity & better than 99% dry steam.



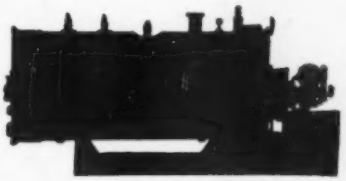
NO EXPENSIVE FOUNDATION

Built on a rigid channel iron base, a Superior Steam Generator needs only a floor capable of supporting its weight.



BUILT-IN CONTROLS

All controls essential to completely automatic operation are factory-wired into an easily accessible control panel.



BURN OIL, GAS, OR BOTH

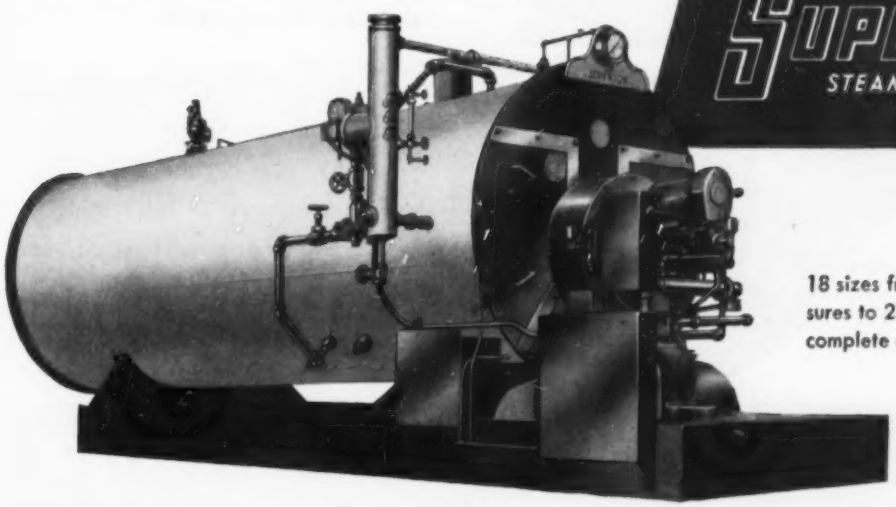
Superior Burners burn oil or gas or a combination of both ... changing from one fuel to the other in seconds.

Superior Steam Generators are the ideal choice for a new steam plant ... the simplest answer to expanding your present plant ... the easiest solution to replacing obsolete boilers.

Guaranteed to develop maximum rated capacities at thermal efficiencies in excess of 80%, their design embodies features which insure long-lived dependability and maximum fuel economy.

for performance you can **BANK** *on*

SUPERIOR
STEAM GENERATORS



18 sizes from 20 to 600 b.h.p. for pressures to 250 p.s.i. or for hot water. For complete details write for Catalog 504.

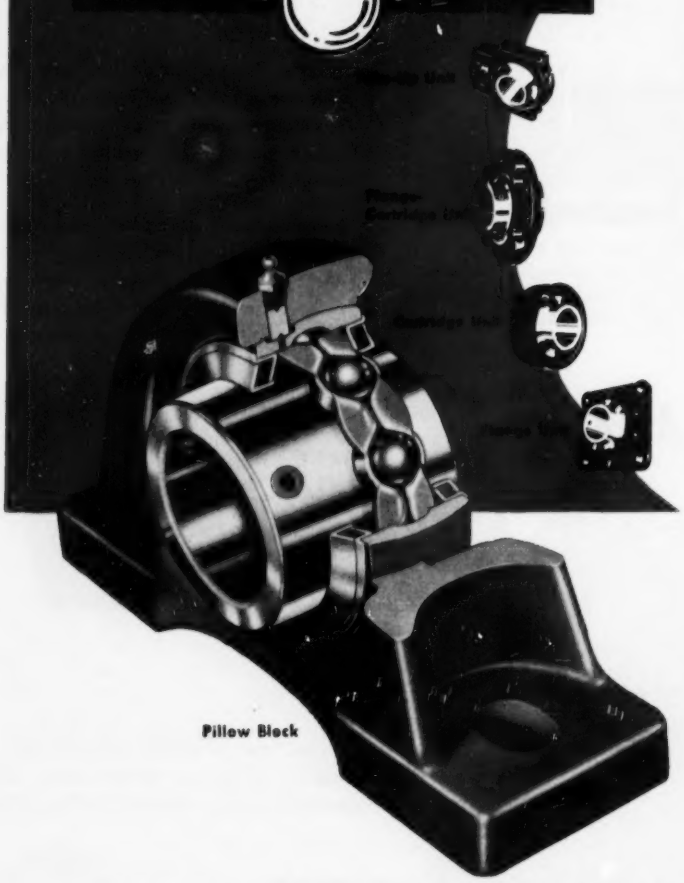
SUPERIOR COMBUSTION INDUSTRIES INC. TIMES TOWER, TIMES SQUARE, NEW YORK 36, N.Y.

YOUR LOGICAL CHOICE

Wherever Bearing Performance and Cost are Important

SEALMASTER

BALL BEARING UNITS



Pillow Block

For ALL These Reasons

1. **PERMANENTLY SEALED**
   to exclude dirt and retain proper amount of lubricant.
2. **SELF-ALIGNING**
   in any direction without seal distortion.
3. **PRE-LUBRICATED**
   with the proper amount of lubricant—for long service.
4. **ZONE HARDENING**
   of ball path section of inner race ring, with extended part of race left soft for better race-to-shaft locking.
5. **NO HOUSING WEAR**
   —patented locking pin and dimple prevent rotation of outer race in housing.
6. **FLOATING BALL RETAINER**
   traps lubricant, prevents churning.

To the thoughtful engineer or operating executive, *each* of these SEALMASTER features is a convincing reason for choosing SEALMASTER Ball Bearing Units. *Together*, this exclusive combination of basic advantages offers sound assurance of top performance *under all conditions*. Write now for your copy of Catalog 845—complete data on the broad SEALMASTER line.

SEALMASTER BEARINGS

A DIVISION OF STEPHENS-ADAMSON MFG. COMPANY • 47 RIDGEWAY AVENUE, AURORA, ILLINOIS

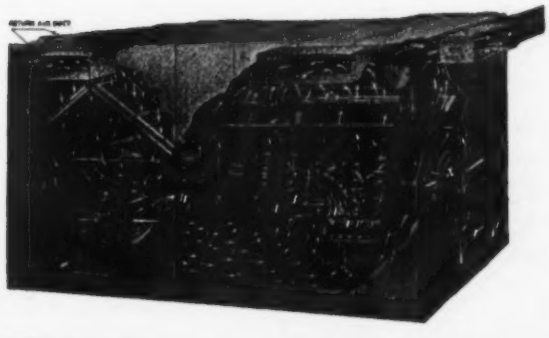
FACTORY REPRESENTATIVES AND DEALERS IN ALL PRINCIPAL CITIES

WARM AIR HEATED... by Campbell

Junior High School Gymnasium, Apex, N. Carolina. Architect, Frank B. Simpson, Raleigh, N.C. Designer, C. Eugene Savage, Raleigh. Heating Contractor, Miller Heating & Sheet Metal Co., Goldston, N.C.

PRACTICAL FOR BIG BUILDINGS

More and more architects and contractors are turning to Campbell for practical warm air heating of large buildings. Campbell Heaters are easy to install; deliver exceptional fuel economy; give long, dependable performance, to assure maximum customer satisfaction. Campbell Heaters are available for all fuels in capacities up to 3,000,000 BTUs.



MANUFACTURERS' AGENTS

We have a number of attractive openings for manufacturers' agents who call on heating contractors and architects. If interested, please state territory you cover.

CAMPBELL HEATING CO.
Des Moines 17, Iowa

I am interested in your proposition for manufacturers' agents.

My territory covers.....

NAME.....

ADDRESS.....

CITY.....ZONE....STATE.....

CAMPBELL HEATING COMPANY
Des Moines 17, Iowa

91% are p-k equipped*

* Yes, 91% of New York skyscrapers use p-k heat exchange equipment—instantaneous hot water heaters, storage water heaters, preheaters, condensate coolers, converters, freon coolers, etc. You get the finest when you specify p-k.

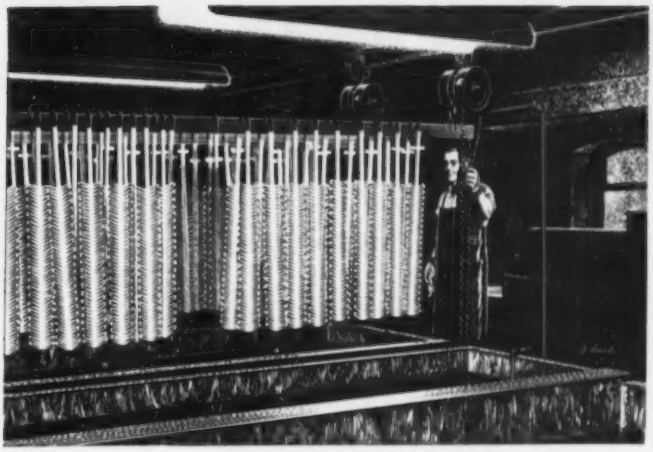
the **Patterson-Kelley Co., inc.**

East Stroudsburg, Penn.

101 Park Avenue, New York 17 • Railway Exchange Building, Chicago 4 • 1700 Walnut Street, Philadelphia 3 • 96-A Huntington Avenue, Boston 16 • and other principal cities

Servel

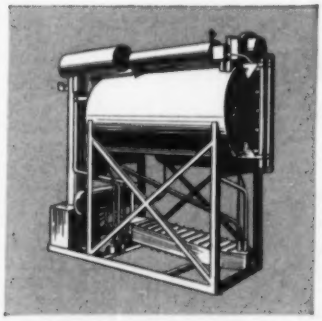
WELCOMES...and SOLVES



tough industrial cooling problems

When Colonial Alloys Company of Philadelphia decided to anodize aluminum products by the new and different Electrodizing Conservation or "EC" process, it faced the problem of maintaining proper temperature of the electrolytic bath solution.

To meet this essential requirement, Colonial Alloys chose a Servel 25-ton Water Chiller. Not only does this single Servel Air Conditioning unit maintain constant, controlled solution temperature, but it also provides office air conditioning, chilled water for experimental work, and cold drinking water.



The 25-ton Water Chiller used in the Servel installation at Colonial Alloys Company.

Colonial Alloys reports that the new "EC" process, in which Servel equipment plays such a leading part, has *increased aluminum anodizing production as much as five times, while cutting costs as much as 99%!*

This is one of many examples of how Servel Air Conditioning equipment benefits industry. Chances are, your problem can be solved in an equally satisfactory manner. Because Servel Air Conditioning *uses heat to produce cold*, operating economy is outstanding. It operates on gas, oil, steam or waste heat—whichever is the most economical fuel in your area. There are *no moving parts* to wear or cause vibration. And every Servel unit carries a complete *five-year warranty*.

★ ★ ★

Servel manufactures the world's finest air conditioning equipment to fit all air conditioning needs—residential, industrial, commercial—all-year or cooling alone. For complete information, clip and mail the coupon today.

Servel

the name to watch for great advances in—

AIR CONDITIONING ✓ REFRIGERATION

SERVEL, INC., DEPT. HP-5, Evansville 20, Indiana

I want to know more about industrial uses of Servel Air Conditioning.

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Title_____

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DOUBLE PROFITS

from super-speed *Ramset System*

FASTENING SYSTEM

for steel and concrete fastenings

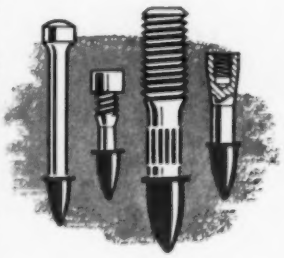
You gain double profits from split-second powder fastening into steel or concrete with long-proved RAMSET SYSTEM. *First*—it takes only seconds with the compact, light-weight JOBMASTER. Just load, position, check and RAM! The job is done instantly. No other tool can match the ease, speed and economy of the JOBMASTER:

One-piece tool . . . visi-chek button . . . trigger action manual safety control...spall diverter...angle-fire control 42-position Roto-set safety shield, for pin-point accuracy and highest speed continuous work even in tight spots.

Thousands of users have proved for six years the time-saving, money-saving advantages of RAMSET SYSTEM, now brought to highest efficiency with the new, improved JOBMASTER.

56 sizes and types of Tru-Set Fasteners

RAMSET'S second big profit maker is the widest range of studs and drive pins in the industry—lengths from ½″ to 6″—diameters from ⅛″ to ¼″, a size and type for every job. Only Tru-Set Fasteners have the Red-Tip Pilot, to guide them straight and true to the work, for firm, accurate penetration.

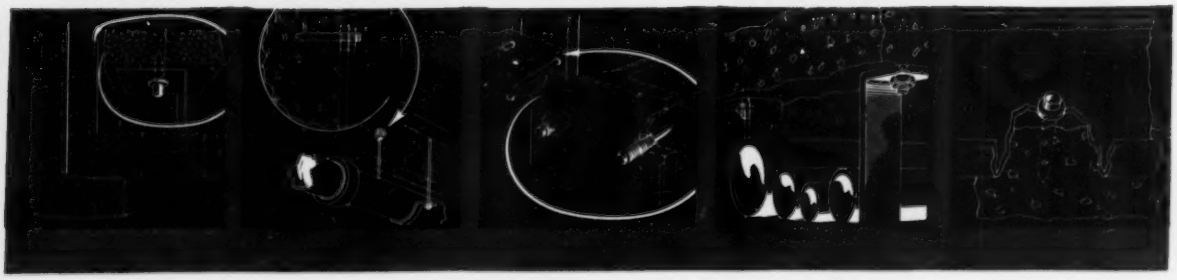


Ask your RAMSET Dealer for on-the-job demonstration and for the most authoritative booklet on powder fastening—*Modern Fastening Methods*. Or, write us for details.

Ramset Fasteners, INC. *Ramset Division, Olin Industries, Inc.,* **12117 Berea Road, Cleveland 11, Ohio**

Ramset does hundreds of jobs like these...FASTER, EASIER, AT FAR LESS COST

Duct Straps | Hanger Rods | Waste Lines | Suspended Piping | Angle Irons



LOOK AHEAD...YEARS AHEAD!

Your customers will applaud your good judgment in selecting

CAST-IRON BURNHAM BASE-RAY

RADIANT BASEBOARD

HERE'S WHY!

1. Only a *fully* waterbacked one piece casting like BASE-RAY* can deliver true radiant heat. No sheet metal false fronts or grills to stop the true passage of radiant heat! Fully waterbacked** BASE-RAY holds heat longer after burner goes off.

2. Only cast iron provides trouble-free service . . . true long range economy. Sturdy cast iron is dent-proof and virtually corrosion-proof. BASE-RAY'S permanent convector fins are cast as an integral part of the unit, will never jar loose.

3. Only the smart streamlined appearance and minimum cross-section (2" x 7") of BASE-RAY offers the ultimate in unobtrusiveness. That means better interior decor!

***Cross section showing how BASE-RAY is filled with water from top to bottom.*

BURNHAM BASE-RAY WEARS LIKE IRON —BECAUSE IT'S MADE OF IRON.

Whether it's a new installation or a modernization job, the pride, the comfort, and the satisfaction of your customer will best be served by this sturdy cast-iron BASE-RAY radiant baseboard installation. Standardize on BASE-RAY and your reputation for good judgment will never be in danger.

**Reg. U.S. Pat. Off.*

Burnham Corporation

BOILER DIVISION IRVINGTON, NEW YORK

FIRST IN THE MANUFACTURE OF BASEBOARD HEATING

Burnham Corporation HP-53
Irvington, New York

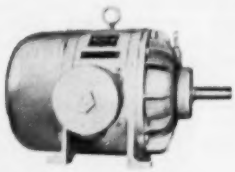
Please send me full information and ratings guide on BASE-RAY

Name .....

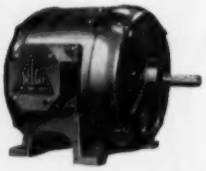
Address .....

City ..... State .....

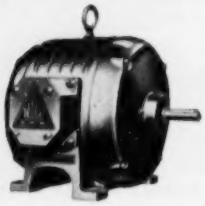
DEPENDABILITY...
that minimizes costs
Delco Motors



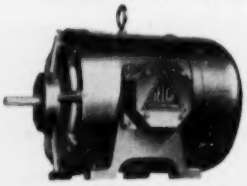
Explosion-proof motor



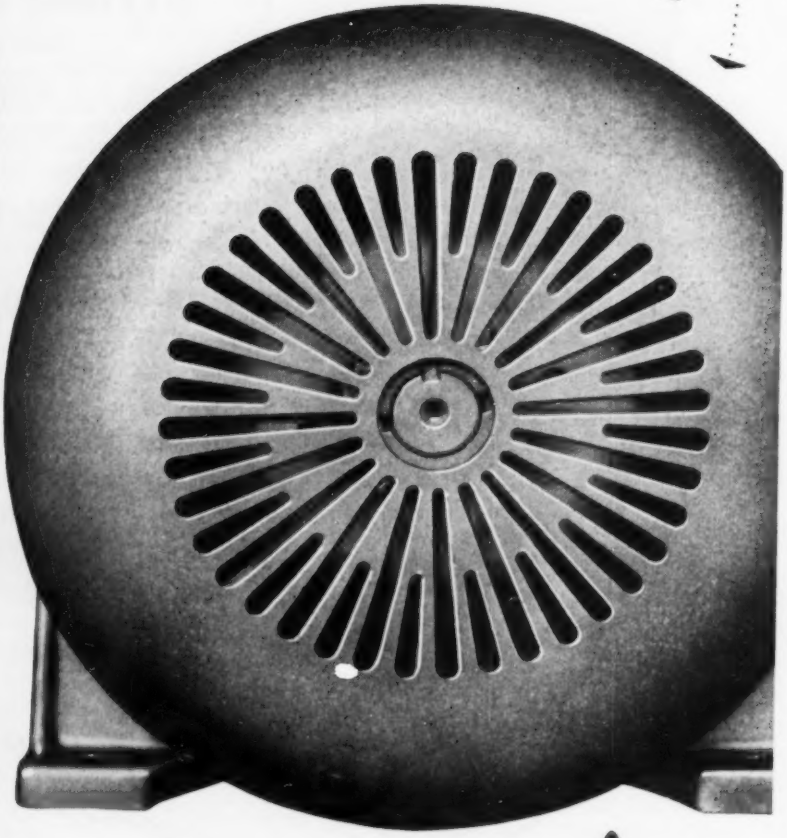
Open ball-bearing motor



Totally enclosed ball-bearing motor



Totally enclosed fan-cooled motor



With Delco integral motors on your machines you have a cost factor on which you can depend.

For Delco designs and builds with one idea in mind—to produce motors that will run dependably, under extreme conditions, for record-breaking periods of time.

Put your trust—and your motor dollars—in Delco motors . . . your nearest Delco sales office will help you with all details.

DELCO
DAYTON OHIO

DELCO PRODUCTS

Division of General Motors Corporation
Dayton, Ohio

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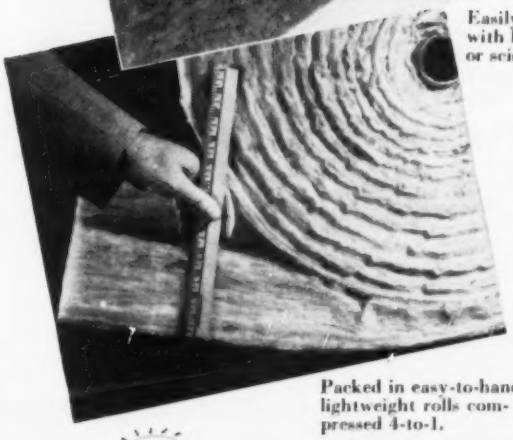
Flexible MICROLITE blanket conforms readily to irregular shapes.

Extremely light in weight with good tensile strength for easy handling in large sections, even overhead.

When you've got ducts to wrap...

You'll save time— You'll do it easiest— with MICROLITE



Easily cut with knife or scissors.

Packed in easy-to-handle, lightweight rolls compressed 4-to-1.

MICROLITE ***Glass Fiber Insulating Wool*** is a natural for wrapping ducts. It's soft—it's resilient—it's pleasant to handle—it's easy to cut.

Extreme light weight of Microlite minimizes attachment and mounting points—without danger of insulation sag. Weighing only ½-pound per cubic foot, enough B-305 Microlite to provide 1″ of insulation on a 1′ x 2′ x 100′ duct weighs only 50 pounds.

Inch for inch, Microlite is one of the most effective of all insulating materials. Half-pound density Microlite has a "k" factor of .25 at 50° mean; a Noise Reduction Coefficient for 1″ thickness of .60. You can't conscientiously proceed with any insulating job until you've investigated Microlite, a product of Glass Fibers exclusive electronic-extrusion process. Write for descriptive Microlite brochure and detailed duct application manual. Glass Fibers Inc., 1810 Madison Avenue, Toledo 2, Ohio.

GLASS FIBERS INC.

Makers of glass fibers by the ELECTRONIC-EXTRUSION process—developed, patented and used exclusively by Glass Fibers Inc.

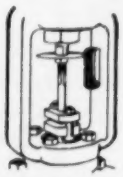
VITRON Yarns • Rovings • Micro-Fibers • Pipe Wraps • Industrial Mats • MICROLITE Thermal and Acoustical Insulation
DURAMAT Vapor Barriers • VIBRAGLASS Mounting and Packaging Materials • COUSTIC-AIRE and THERMO-JET Aircraft Insulations

Single wrench maintenance

check these time and money-saving maintenance features

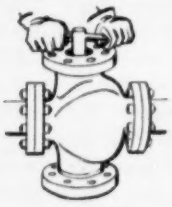
1 **CAST FLATS** make bolts easy to remove on superstructure. Heads can't turn . . . only one wrench needed.

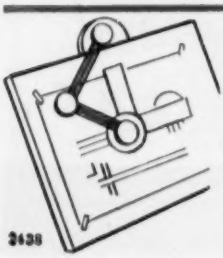
2 **WIDE YOKE**—plenty of room for big hands to work with that one wrench.



3 **FLATS** on valve stem use same adjustable wrench—does not score stem.

4 **SEAT RINGS** can be renewed without taking the valve body from the line. No vises, no lathes. Standard Leslie practice for 27 years, not a theory, a proven fact.



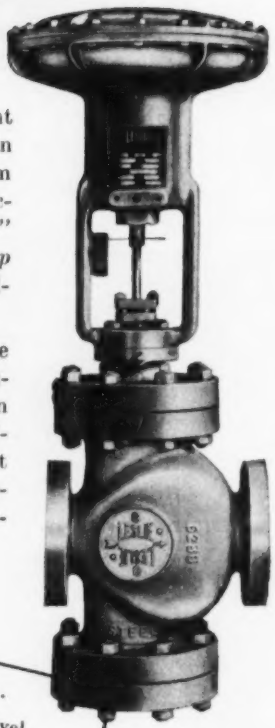


5 **INTERCHANGEABLE** parts keep inventory small, reduce down-time. Top grade materials and engineering means less maintenance.

3638

There are a host of important features found as *standard* in Leslie Double-Seated Diaphragm Control Valves usually manufactured only in "made-to-order" units — features that mean *top* performance and *extra*-dependable service.

But here's one more advantage that makes Leslie the most popular valve with maintenance men —SINGLE WRENCH MAINTENANCE. They find that maintaining the Leslie Double-Seated Control Valve is a one-tool job.



WHEN SPECIFYING . . .

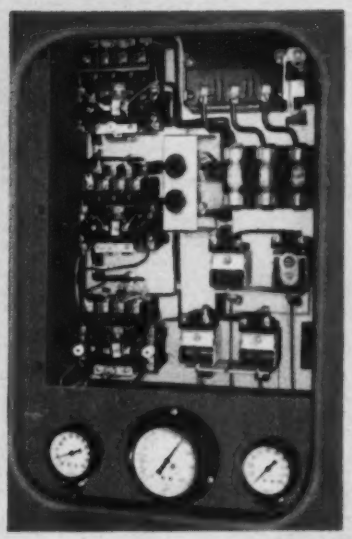
for pressure, temperature and level controls, a quick check can prevent ordering a *special* that Leslie makes as *standard*. A call to your Leslie Engineer, before you specify, is free insurance. He's listed under "Valves" or "Regulators" in the classified telephone directories in principal cities.

Send for free Bulletin 5305

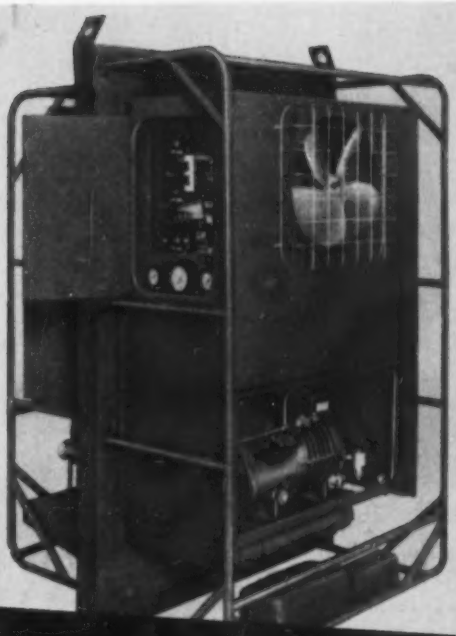
12 new pages of valuable data on double-seated diaphragm control valves.

TRADE LESLIE MARK

LESLIE CO., 237 GRANT AVE., LYNDHURST, N. J.



Close-up of the control panel, showing Allen-Bradley solenoid starters, high pressure cutout, and remote bulb temperature controls.



AMANA completely self-contained plug-in type refrigeration unit, fully equipped with Allen-Bradley motor controls.

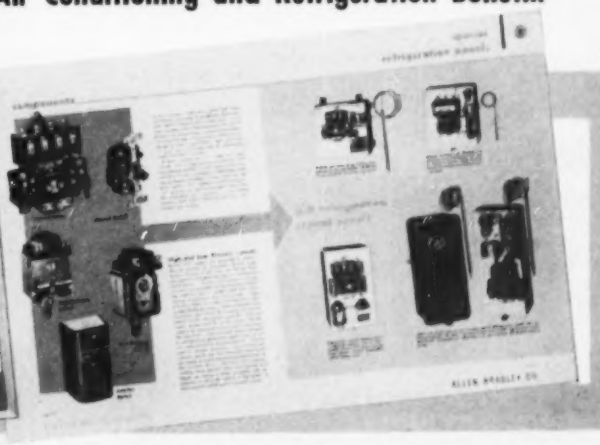
AMANA REFRIGERATION UNIT *equipped with* ALLEN-BRADLEY TROUBLE FREE MOTOR CONTROLS

A-B Quality

Why are Allen-Bradley starters so popular for refrigeration and air conditioning service? . . . because they are trouble free. Only ONE moving part. No pivots, pins, or bearings to corrode or stick . . . no jumpers to break. You install them . . . and forget them! No contact maintenance . . . Allen-Bradley silver alloy contacts never need cleaning, filing, or dressing. Dependable overload relays . . . Allen-Bradley thermal relays are accurate and always dependable . . . even after long service.

Write for this Allen-Bradley Air Conditioning and Refrigeration Bulletin

Allen-Bradley Company
1335 S. First St.
Milwaukee 4, Wis.



ALLEN-BRADLEY QUALITY MOTOR CONTROLS

avoid trouble and complaints

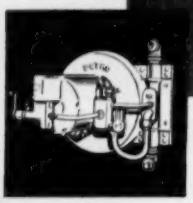
Contractors and Engineers KNOW they can depend on

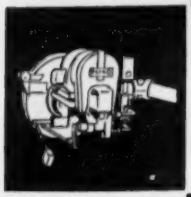
Petro OIL BURNERS

Specialists in oil heating for 50 years

Industrial Oil Burners

Rotary type. Burn low-cost, heavy fuel oil with complete reliability. Models for every industrial need. Capacities up to 200 gallons per hour.



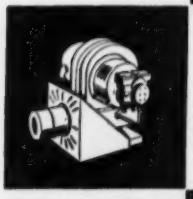


Combination Oil-Gas Burner

This commercial industrial burner is the answer to seasonal fuel shortages. Makes possible advantages in economical fuel buying.

Residential Furnaces and Boilers

Made in popular sizes to fit the heating needs of homes from 4 to 10 rooms. Extremely compact and attractive. Real fuel savers.

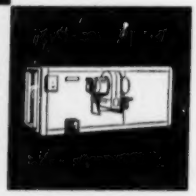


Conversion Units

Efficient, trouble-free oil burners for home and commercial use. Capacities up to 20 gallons per hour.

Horizontal Furnace

Hang it or hide it—this winter air conditioner fits anywhere. Available in five models from 80,000 to 180,000 Btu's (output at bonnet).



Complete Line

There's a size and type of Petro oil burner, or home furnace or boiler, to fit every oil firing need. The name Petro, since 1903, has been known and respected wherever oil burning equipment is used.

Simple, Dependable Operation

Petro oil burners cost the plant operator or homeowner less to own and operate because their performance is proved and simple. The fine reputation Petro equipment enjoys, and its popularity with owners, is the result of this simplicity and traditional dependability.

Easily Installed

Petro oil burners are compact and well built. Heavy mounting flanges, protected wire connections, easy access to oil and ignition lines, are all features which help make Petro oil burners the favorite of contractors and dealers all over the nation. They save installation time—they cut service calls.

Get Latest Information

Illustrated literature and specification sheets gladly sent free. Write Petro, 3187 West 106th Street, Cleveland 11, Ohio.

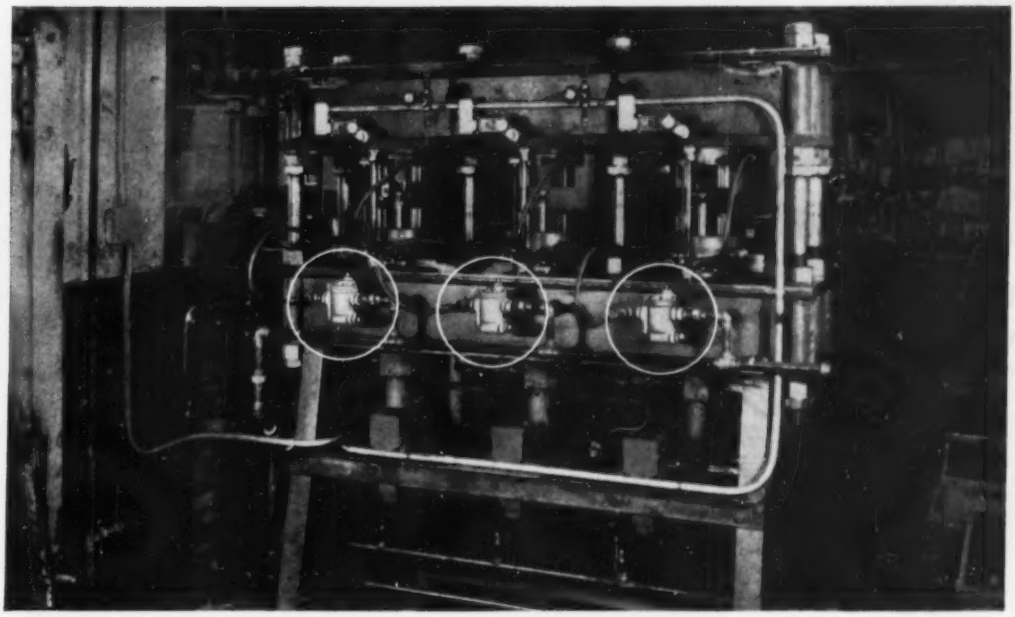
INDUSTRIAL—COMMERCIAL—RESIDENTIAL OIL BURNERS FOR EVERY FIRING NEED

PETRO

50 YEARS OF LEADERSHIP IN AUTOMATIC HEATING

3187 W. 106th St., Cleveland 11, Ohio

Relies on Armstrong "Unit Trapping" to maintain molding press temperatures within ±5°F.



Uniform molding temperatures reduce leather cup rejects by 40%!

MANY a plant has accepted erratic temperatures of steam heated equipment as a necessary evil. Not so at Albert Trostel & Sons Company, Milwaukee, manufacturers of molded synthetic rubber and leather parts. They unhesitatingly replaced an electrically heated molding press, that varied in temperature as much as 30°F., with a steam heated press because they knew from previous experience that Armstrong Unit Trapping would give them uniform temperature control. Their confidence was not misplaced. An indivdual Armstrong steam trap on each station of the press keeps temperatures uniform within plus or minus 5°F. Molded leather cup rejects have been reduced by 40% and production greatly increased.

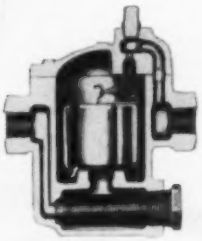
The benefits of Armstrong Unit Trapping are easy to understand. First, if you drain more than one unit with a single trap, any variation in pressure between the units will cause condensate and air from a higher pressure unit to block drainage from a slightly lower pressure unit or section. With an individual trap on each unit this cannot happen. Secondly, Armstrong traps discharge condensate and air as fast as they accumulate so that every unit is always full of hot dry steam and, hence, at maximum temperature.

Let your local Armstrong Representative look over your condensate drainage system—he sells Armstrong traps under a *satisfaction-or-your-money-back guarantee.* Call him or write:

ARMSTRONG MACHINE WORKS

874 Maple Street • Three Rivers, Michigan

BONUS VALUE



Built-in Strainer Trap Saves Money, Maintenance

Small traps need strainer protection against dirt and scale. Howard Knoller, V.P. & Plant Engineer of Albert Trostel & Sons Company, uses and likes Armstrong No. 880 traps with built-in strainers because: they cost less than a trap plus separate strainer; save fittings and installation labor, and the strainer can be cleaned without removing trap or shutting off steam.

You Always Get Greater Efficiency When You Use Armstrong Unit Trapping

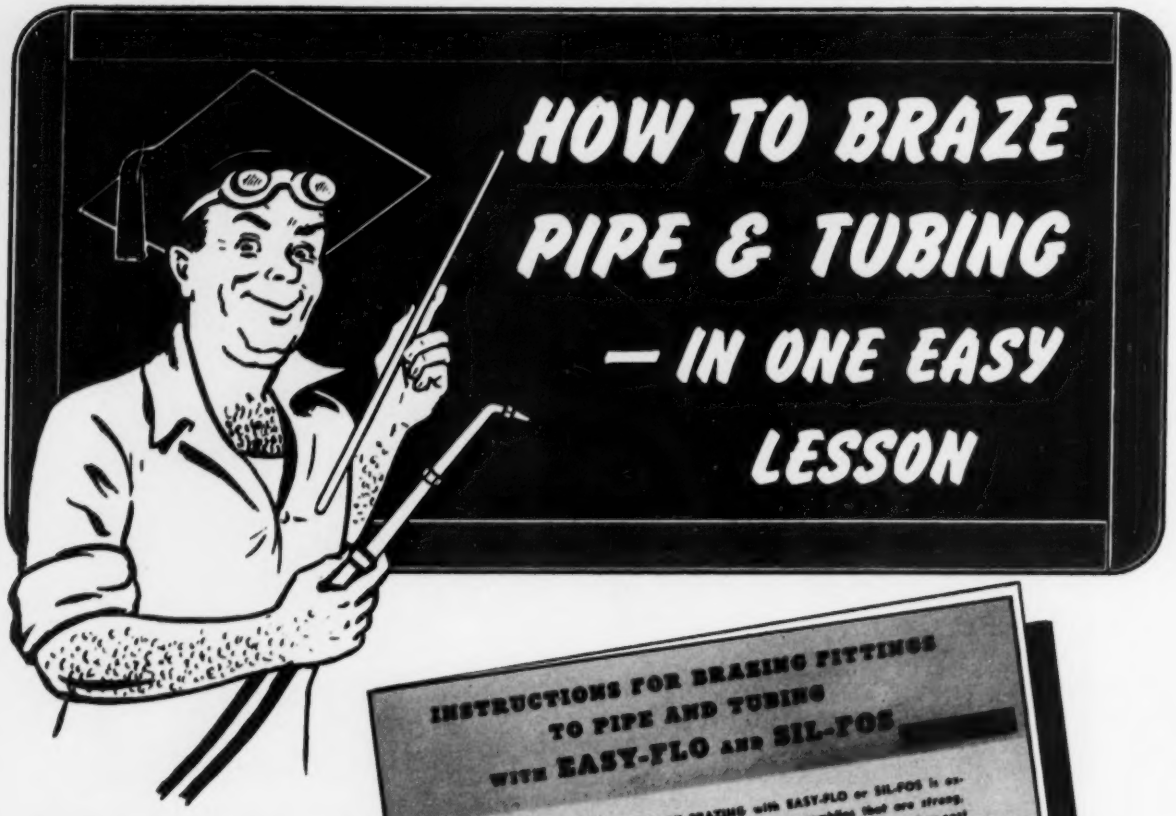
FREE
44-PAGE
STEAM TRAP BOOK
Gives Complete Data

FILL IN AND CLIP TO YOUR COMPANY LETTERHEAD

ARMSTRONG MACHINE WORKS
874 Maple Street, Three Rivers, Michigan
Please send me The Steam Trap Book.

Name .....

Title .....



BULLETIN 17

gives step-by-step directions for torch-brazing fittings to pipe and tubing with the low-temperature silver brazing alloys EASY-FLO and SIL-FOS —the fast, low-cost way to get permanently leak-tight, maintenance-free assemblies. Write today for your copy of Bulletin 17.

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QUALITY SERVICE
ORIGINATORS OF EASY-FLO & SIL-FOS

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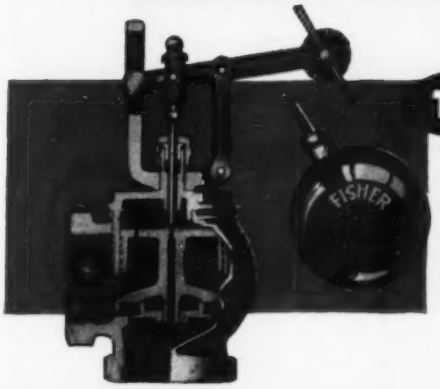
DEPEND ON FISHER®

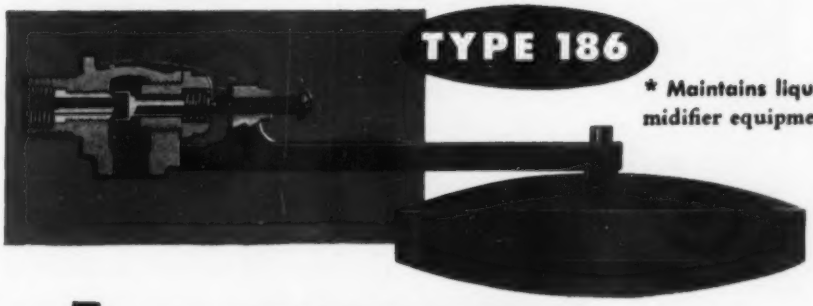
float valves

FOR GENERAL OPEN TANK SERVICE



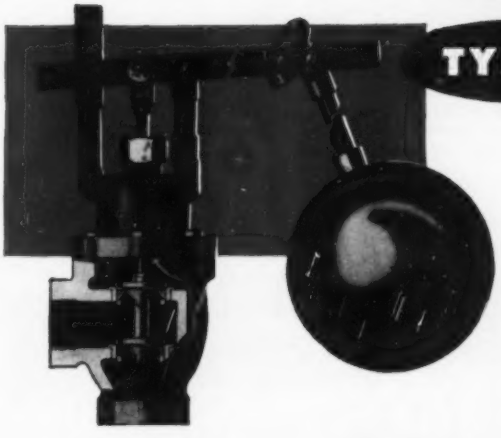
TYPE 171

* Bronze float valve for automatic control of liquid levels in all types of open vessels. Particularly recommended for service where positive shut-off is required. Single seated composition disc inner valve balanced by accurate fitting piston — fluctuating inlet pressures do not affect valve operation.



TYPE 186

* Maintains liquid levels in various types of humidifier equipment or in small tanks where flow rates are moderate. Suitable for all non-corrosive liquids. Composition valve disc assures positive shut-off.



TYPE 17

* Maintains liquid levels in open tanks, vats, reservoirs and similar containers by automatically controlling the flow rate to or from the vessel. Double seated V-port type inner valve provides throttling control — eliminates water hammer. Iron or steel body — bronze, stainless steel or other special metal trim.

Fisher float valves for automatically controlling liquid levels in all types of open vessels are available in various types and designs. Wide selection of body and trim material to handle different liquids. Complete description and details in Bulletin FG-70. Write for your copy today.

FISHER GOVERNOR COMPANY • Marshalltown, Iowa

FISHER®

WORLD LEADER IN THE MANUFACTURE OF LIQUID LEVEL CONTROLLERS, PRESSURE REGULATORS AND IN RESEARCH FOR BETTER CONTROL

BRUNER
WATER SOFTENERS & FILTERS

WATER SOFTENERS
FOR INDUSTRY

Some recent installations of BRUNER industrial equipment:

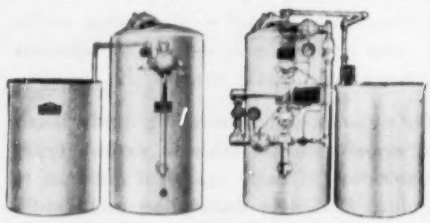
- Flint, Michigan — Chevrolet Division, General Motors
- Amarillo, Texas — Pantex Ordnance
- New Orleans, La. — Jung Hotel
- Peoria, Ill. — Methodist Hospital
- Jacksonville, Florida — Jacksonville Power Plant #2
- Lansing, Mich. — Michigan State College
- Exeter, Calif. — Exeter Memorial Hospital

Hundreds of other huge installations of BRUNER softeners and filters from coast to coast and from border to border include almost every state in the Union.

These new improved single units now available from stock, deliver 1,200,000 GR capacity with flow rate up to 150 GPM.

Twin units provide double capacity at twice the flow rate. Special units with up to 10,000,000 GR capacity at 800 gallons per minute can be supplied.

Bruner exclusive type automatic backwash control has no moving parts, guarantees no loss of mineral at high pressures yet assures positive cleaning of mineral bed at low pressures.
Dowex Lifetime Mineral is supplied as standard. Green sand or synthetic zeolite can be furnished. Your inquiry will receive prompt attention.



Dial-O-Matic and Solo Valve Heavy-duty models 80 to 160 GPM — 600,000 to 1,200,000 GR carried in stock.

Brucex Feeder for corrosion control.

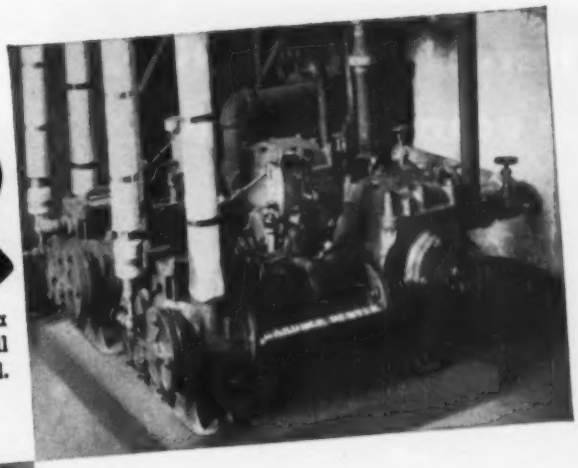
"America's Most Complete Line of Quality Water Softeners and Filters".

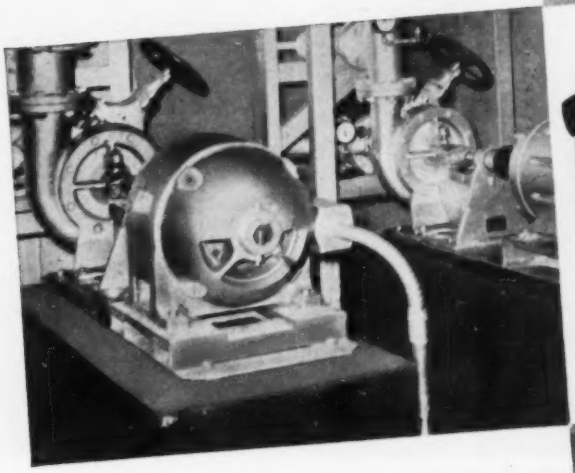
Offices in principal cities.

BRUNER CORPORATION • 2318 North 30th Street MILWAUKEE 45, WISCONSIN

POWER

Installed in a New Orleans plant in 1907, a Gardner-Denver Duplex Pump like this is still in use—is still called the best pump in the mill.



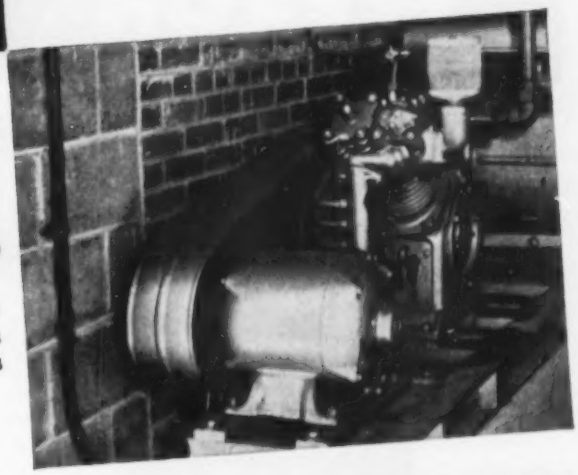


ROOM

A midwest water works reports it has operated a Gardner-Denver Centrifugal Pump for 17 years, with no repairs.

TALK

In a Canadian laundry, a Gardner-Denver Air-Cooled Compressor has run for 8 years steady—without even having the valves cleaned.



TELLS THE STORY OF...

CUSTOMER SATISFACTION WITH GARDNER-DENVER EQUIPMENT

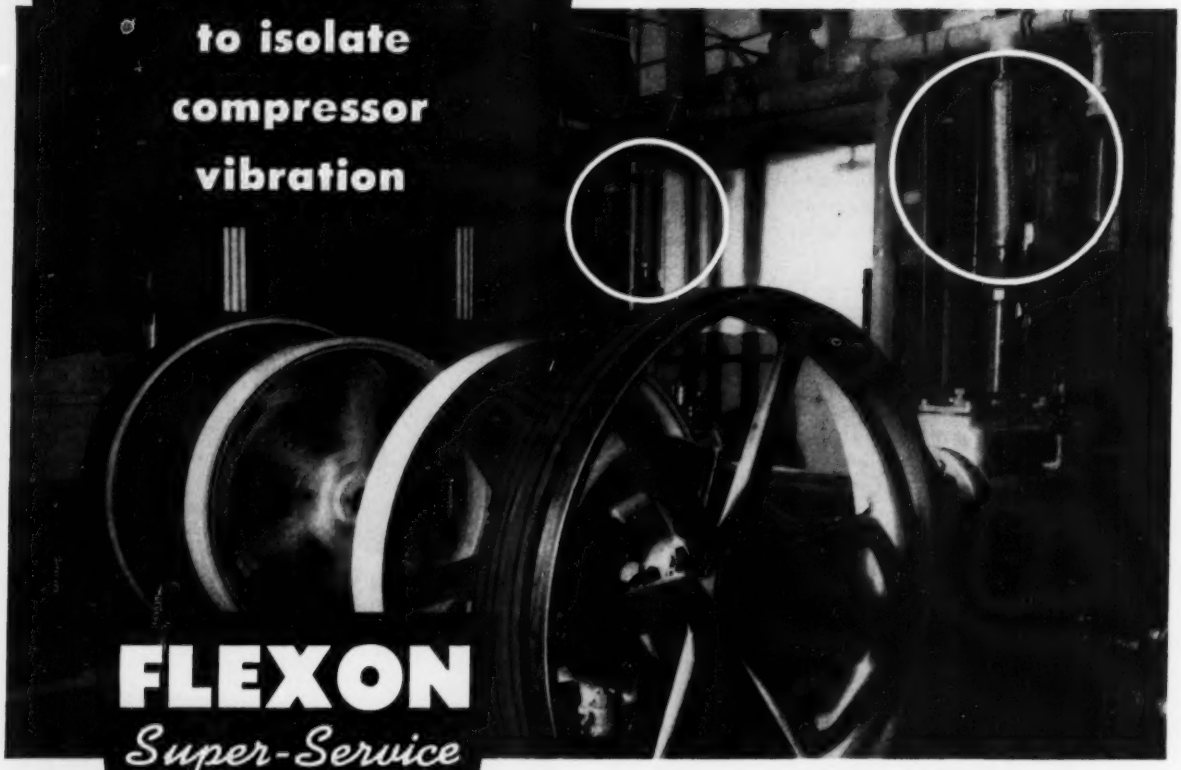
Send for descriptive bulletins.

SINCE 1859 **GARDNER-DENVER**

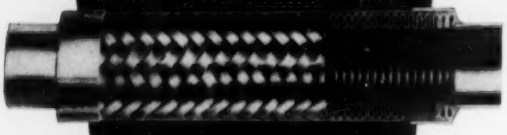
Gardner-Denver Company, Quincy, Illinois
In Canada: Gardner-Denver Company (Canada), Ltd.,
14 Curity Ave., Toronto 13, Ontario

THE QUALITY LEADER IN COMPRESSORS, PUMPS AND ROCK DRILLS FOR CONSTRUCTION, MINING, PETROLEUM AND GENERAL INDUSTRY

Here's the effective, economical way to isolate compressor vibration



FLEXON
Super-Service
VIBRA-SORBERS



VIBRA-SORBERS are available in bronze with copper tube ends in sizes from 1/8" through 4" I.D. Also available in steel in sizes from 5" through 12" I.D.

In refrigerating or air conditioning systems, on turbines, pumps, air compressors or any equipment in which vibration is a problem, you can keep the damaging effects of the vibration out of rigid piping with FLEXON VIBRA-SORBERS. These scientifically designed units have the proper amount of flexibility to harmlessly dissipate the vibration. Important, too, particularly in air conditioning systems, is the VIBRA-SORBER'S ability to isolate noise and prevent its transmission throughout a building.

Whenever you have a vibration problem, consider a VIBRA-SORBER first. They are economical, dependable and as easy to install as a section of pipe or tubing. Write for full details. VIBRA-SORBERS are available from stock at leading refrigeration supply jobbers throughout the nation.

CHICAGO METAL HOSE Division

Flexonics *Corporation* 1391 South Third Avenue, Maywood, Illinois

In Canada: Flexonics Corporation of Canada, Ltd., Brampton, Ontario

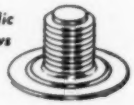
Flexon identifies CMH products that have served industry for over 50 years.

CMH

Flexible metal hose

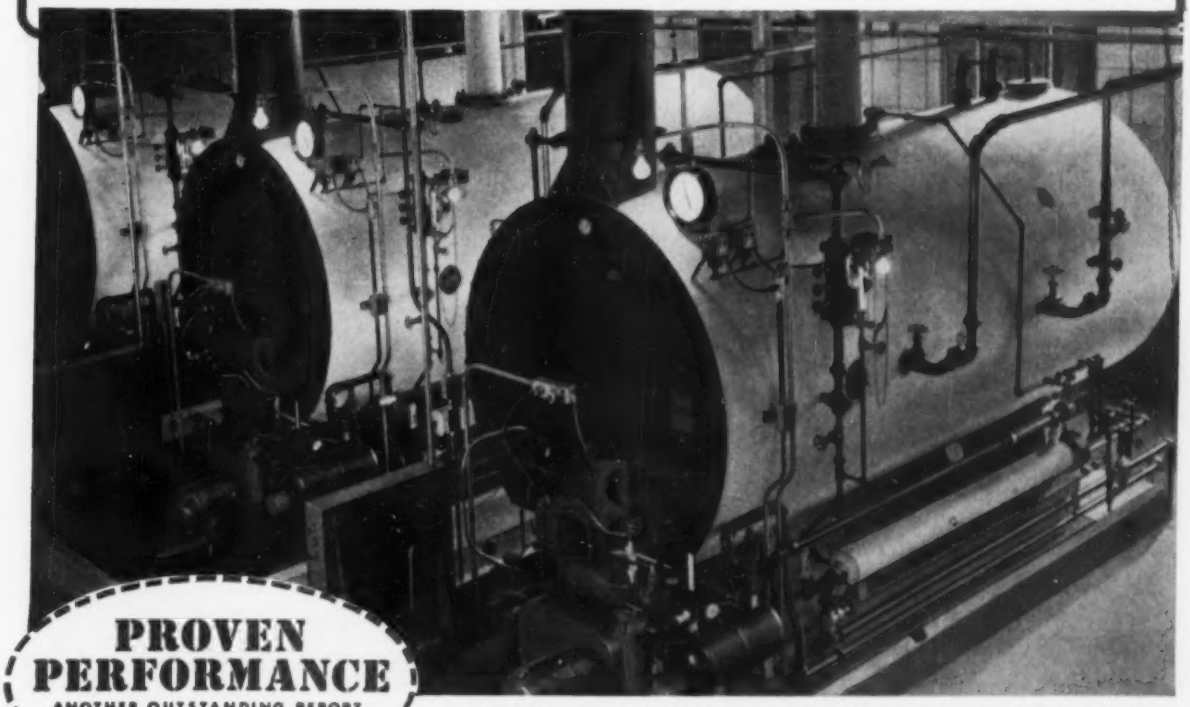
Expansion joints

Aircraft components



Metallic bellows

Cleaver-Brooks boilers save $25,000 per year for Hoosac Mills...pay for themselves in 2 years' time!



PROVEN PERFORMANCE
ANOTHER OUTSTANDING REPORT FROM A CLEAVER-BROOKS OWNER

After installation and starting service was completed, a check was made on boiler output. Tests indicated efficiency exceeded the guaranteed 80%. After eight months' operation without tube cleaning, stack temperature showed no noticeable gain, indicating high efficiency had been maintained. *Planned and installed by Frank I. Rounds Co., Newton Highland, Mass.*

INSTALLING 3 Cleaver-Brooks self-contained boilers at Hoosac Textile Mills, New Bedford Division, was a major step in ending boiler worries. Hoosac can count on yearly savings of $25,000, and they're set up for future expansion as well.

Before deciding what type of boilers to install for replacing old, hand-fired boilers, Hoosac carefully considered these factors:

1. **Efficiency of steam generation** — the cost for supplying 12,000 lbs. of steam required each hour at peak capacity for heating and processing.
2. **Saving labor costs** — through safe, automatic operation.
3. **Cleanliness** — important to textile manufacture.

A study of past performance and prominence of similar units in the industry — showed that Cleaver-Brooks self-contained boilers would fill the bill.

Guaranteed 80% thermal efficiency was one of many influencing factors in selecting the 3 Cleaver-Brooks 150 hp. boilers. Even with loads as low as 30% of rating, these boilers operate with a flat 80% efficiency. (Hoosac operates their plant over widely fluctuating loads, particularly in summer.)

That they attained their objectives is borne out by these results — *results which showed the boilers paid for themselves in 2 years' time.*

1. **$15,000 savings in fuel** — fuel cost studies showed 275,000 gals. of oil at 5½¢ per gal. provide steam for a year's operation. Same steam formerly required 2,000 long tons of coal at $15.00 per ton.
2. **$10,000 savings in labor costs** — fully automatic operation minimized boiler maintenance. Personnel were then available for productive plant work.
3. **Cleanliness** — modern boiler room proved more efficient than previous cluttered arrangement. Hand firing, removal and disposal of fly-ash was eliminated.

In addition to these substantial savings, the installation provided for economical future plant expansion. At present, boiler operation is rotated so all three periodically receive the same service and maintenance.

Cleaver-Brooks boilers are showing similar savings in many other businesses. Investigate — write for Catalog AD-100 and complete information on standard size oil, gas, combination oil/gas fired Cleaver-Brooks boilers, 15 to 500 hp., 15 to 250 psi.

CLEAVER-BROOKS COMPANY
Dept. F-313 E. Keefe Ave.,
Milwaukee 12, Wis., U.S.A.

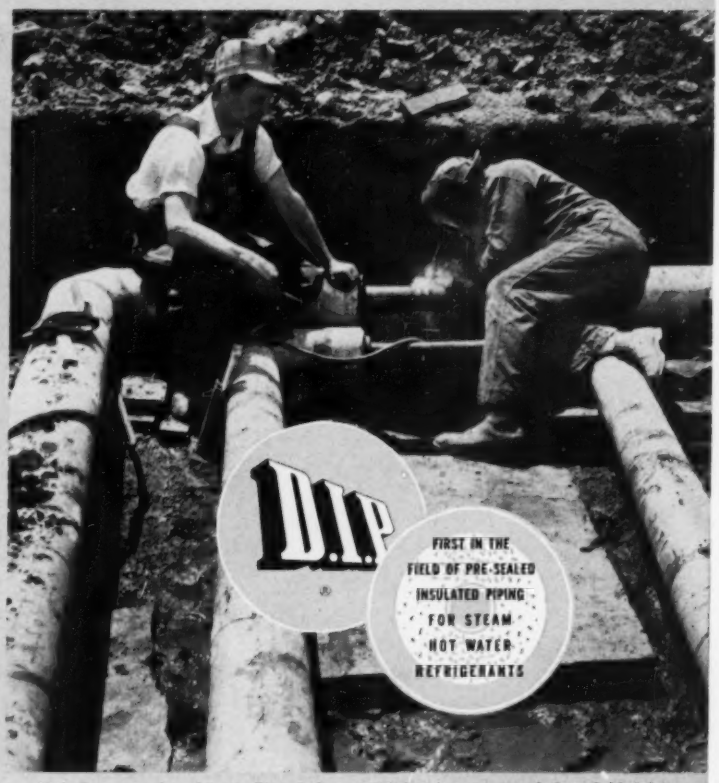
Cleaver-Brooks
ORIGINATORS OF THE SELF-CONTAINED BOILER
Steam Boilers • Oil and Bitumin Tank Car Heaters • Distillation Equipment
Oil and Gas Fired Conversion Burners

Pre-Fabrication makes a D.I.P. Conduit System Easy to Install

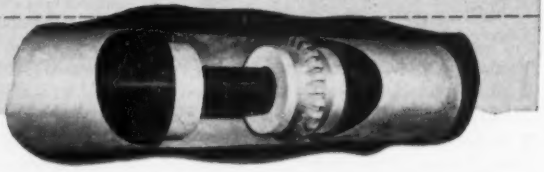
Here's what 2 Contractors say about DURANT INSULATED PIPE:

1. A superintendent had this to say about an air force job involving a large amount of D. I. P.: "All D. I. P. went in place exactly according to the Durant drawing except for one change: we had to cut off about 2" on one pipe." The superintendent also stated that, in his opinion, "if any contractor ever put in D. I. P. and had had experience with other types of underground pipe, that contractor would install *only* D. I. P. in the future."

2. A mid-western contractor said this about a D. I. P. installation: "On our job at J....., the D. I. P. went in perfectly: we had no trouble whatever. Furthermore, in the Spring a year ago, that area was flooded and the entire installation was under water for several months. This past Winter no trouble occurred in the D. I. P. system in spite of the flooding."



D. I. P. expansion loops. Pipe being welded prior to completing field joint.



D. I. P. railroad installation.

Many advantages come with D. I. P.: Installation costs are extremely low because this conduit can be laid on the bottom of a graded open trench. No external casing welding, no drains, tile, concrete tunnels, nor special tools or equipment are needed. D. I. P. does not require additional protection for superimposed loads—such as under roads or tracks. And D. I. P. is the *only* pre-sealed insulated conduit not dependent on a metal jacket for protection from moisture and corrosion: a 1" layer of asphalt is the water-proofing protection.

Our new major Catalog 5-A is about to come off press. May we have your name and address so we can mail you a copy?

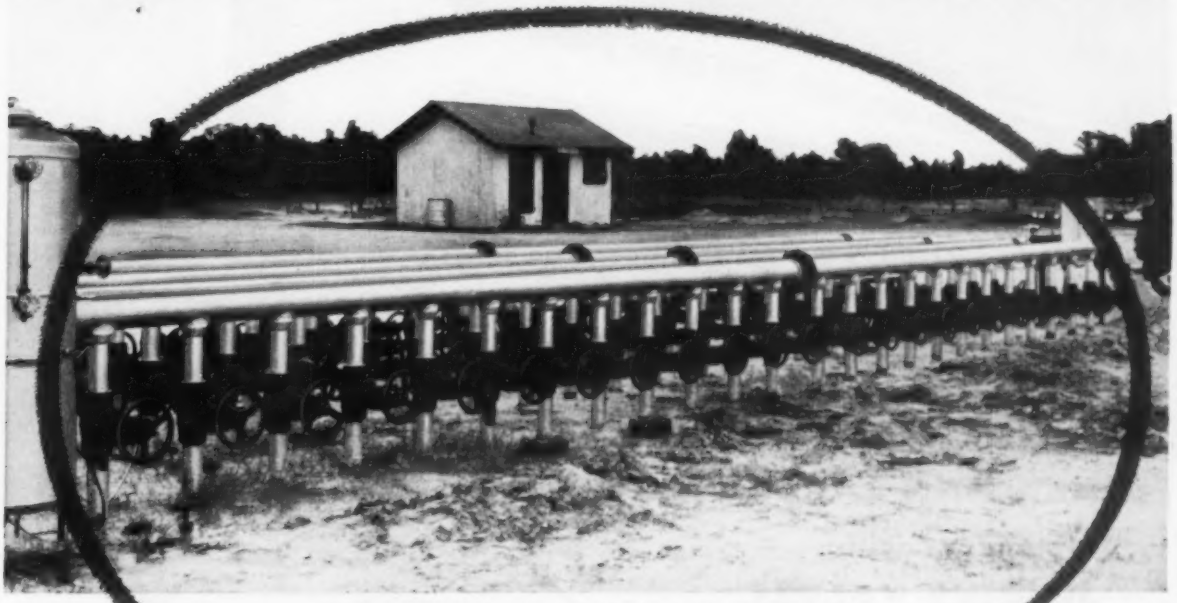
Representatives in Principal Cities

PRE SEALED

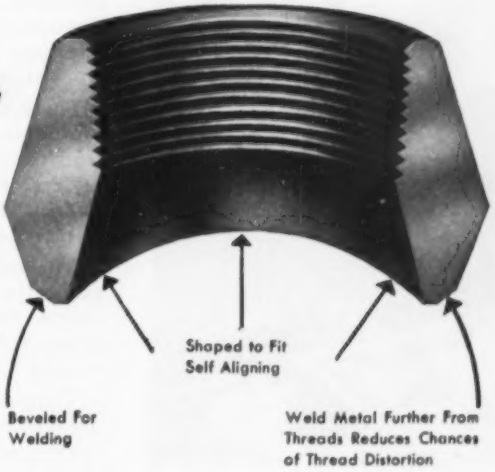
Western Division: **DURANT INSULATED PIPE COMPANY**
DEMETER STREET OFF BAY ROAD, PALO ALTO, CALIFORNIA

Eastern Division: **DURANT INTERNATIONAL CORPORATION**
WILLIAMSTOWN, NEW JERSEY

BOOST YOUR PRODUCTION with THREDOLETS and SOCKET WELDOLETS!



ThredOlets at work in L. P. Gas Plant Production Separators. 4" x 2" ThredOlets utilized for branch connections on manifolds subjected to contraction, expansion and vibration. The ThredOlet's short height and wide footing creates rugged branch construction.



Insure production economy in pipe fabrication through the *exclusive* features *engineered* and *manufactured into* ThredOlets and Socket WeldOlets. Production is boosted because you weld *more pieces* per hour!

Instant application and immediate availability will save you time, labor and money in constructing all 90° Threaded and Socket-weld branch connections.

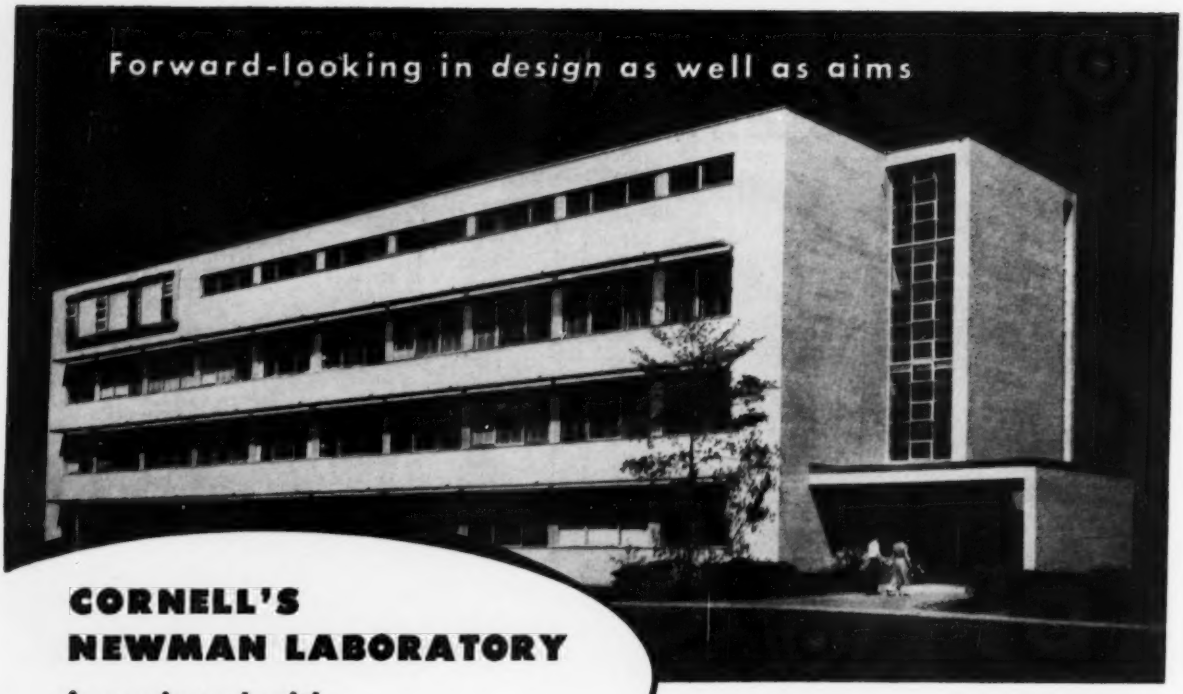
SPECIFY AND USE...
BONNEY THREDOLETS & SOCKET WELDOLETS

ThredOlets

Socket WeldOlets

FOR COMPLETE ENGINEERING DATA WRITE FOR YOUR BONNEY W-3 WELDOLET CATALOG
DISTRIBUTORS IN PRINCIPAL CITIES

WELDING FITTINGS DIVISION
BONNEY FORGE & TOOL WORKS
ENG. DEPT., 715 MEADOW STREET
ALLENTOWN, PENNSYLVANIA



CORNELL'S NEWMAN LABORATORY is equipped with JENKINS VALVES

Architects: SKIDMORE, OWINGS AND MERRILL
Consulting Engineer: GUY B. PANERO
General Contractor: BARR AND BARR
Plumbing Contractor: H. J. BARBHAM AND SONS

As carefully planned as the Laboratory's program of basic research was its physical plant and equipment. Here are some of the many Jenkins Valves which serve the main laboratory (30,000 sq. ft. of working floor area) and adjoining synchrotron building. Picture shows manifold for zone heating, with hot water circulation lines.

Far above Cayuga's waters stands a modern laboratory dedicated to a problem as old as physics—investigating the elementary particles of nature. In plant and equipment, the Floyd Newman Laboratory of Nuclear Studies at Cornell University is a physicist's dream come true.

There are 23 laboratories, including four for radio-chemical and bio-physical research, and also dark rooms, shops, offices, synchrotron control and detector rooms, and a roof laboratory for cosmic ray research. Both the main laboratory and the connecting building housing a 300-million-electron-volt synchrotron are constructed of reinforced concrete and are completely air conditioned.

The same future-minded planning governed the specification of *all* plant operating equipment. For vital service lines, such as power and steam, Jenkins Valves were selected. This confidence in the *extra measure* of efficiency and endurance provided by Jenkins Valves is shared by the nation's leading architects, engineers and contractors.

Despite this extra value, *you pay no more* for Jenkins Valves. For new installations, for all replacements, let the Jenkins Diamond be your guide to lasting valve economy. Jenkins Bros., 100 Park Ave., New York 17.

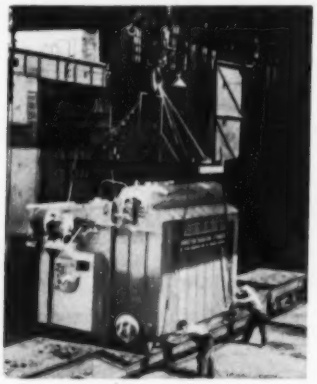
JENKINS
LOOK FOR THE DIAMOND MARK
VALVES
SINCE 1864 MADE JENKINS MARK
Jenkins Bros.

Sold through leading Industrial Distributors everywhere

EQUIPMENT DEVELOPMENTS...

Water-tube Boiler

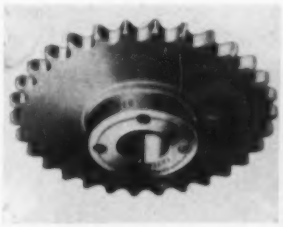
HPAC 1—Standardized, shop-assembled water-tube boiler for pressure range to 250 psi and steam capacities from 4000 to 30,000 lb per hr . . . "C-E Package Boiler, Type VP," design is the two-drum, vertical-bent-tube arrangement with a water-cooled furnace in front of the convection surface. The boiler is designed for pressure firing of oil or gas or in combination. According to the manufacturer, the use of a centrifugal-type forced-draft fan eliminates

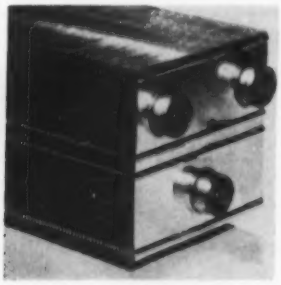


the need for a high stack or an induced-draft fan. In addition, the boiler is equipped with an automatic control system to adjust the air and fuel supply in proper proportion to the needs of fluctuating loads. Lifting lugs are provided so that it may readily be unloaded and handled by a crane. [Manufacturer: Combustion Engineering-Superheater, Inc., 200 Madison Ave., New York 16.]

Sprockets and Roller Chains

HPAC 2*—"Taper-Lock" sprockets and roller chains now available from distributors' stocks. The sprockets and bushings are available in a range of sizes so that reboring of sprockets to fit shafts is said to be eliminated. Both chains and sprockets are made to ASA standards. Distributors will carry a large range of B-type steel sprockets, 40 to 100 pitch. All bushings and smaller-size sprockets are packaged individually. Chains will be packaged in 10-ft lengths and can be furnished in 50 and 100-ft reels. [Manufacturer: Dodge Mfg. Co., 500 S. Union St., Mishawaka, Ind.]





Above: Sprocket
Right: Tubing

Inner-finned Tubing for Heat Transfer

HPAC 3—New inner-fin method of heat transfer now used in packaged air conditioning equipment . . . Basic principle is the introduction of longitudinal finned surface within a tube in addition to the arrangement of a series of individual fins around the outside of a tube. According to the manufacturer, the chief advantages of the new development are increased efficiency and space saving. Recently put into production, the company predicts its eventual inclusion in all types of air conditioning and commercial refrigeration products. [Manufacturer: The Bush Mfg. Co., 179 South St., West Hartford 10, Conn.]

Close-Coupled Turbine Pump

HPAC 4—"Apco" V-type close-coupled turbine pump with mechanical seals in capacities 3 to 30 gpm and heads from 0 to 250 ft. The pumps have a suction lift of 28

For your convenience in obtaining more information about any of this equipment, use this coupon. Add the new products and companies listed here to your Directory Section which you received in your January 1953 Heating, Piping & Air Conditioning, and thus keep your records of sources of supply up to date throughout the year. Single asterisk indicates equipment not listed in Directory Section: double asterisk, equipment and manufacturer not listed.

FOR YOUR CONVENIENCE

[5-53]

Heating, Piping & Air Conditioning
6 N. Michigan Ave., Chicago 2, Ill.

Please ask the manufacturers to send me more information about equipment mentioned under these reference numbers in Equipment Developments.

(Circle each HPAC number in which you are interested)

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
16 17 18 19 20 21 22 23 24 25

Name _____ **Title** _____

Company _____

Address _____

City _____ **Zone** _____ **State** _____

ft at sea level with reduced capacities beyond 22 ft. According to the manufacturer, the close-coupled design reduces the pump-motor assembly to a small over-all size, and because pump and motor shaft are integral, coupling noise and misalignment are avoided. The manufacturer also states that because the pumps handle vapor entrapped in liquid without losing prime, they will not vapor bind. [Manufacturer: Aurora Pump Co., 80 Loucks St., Aurora, Ill.]

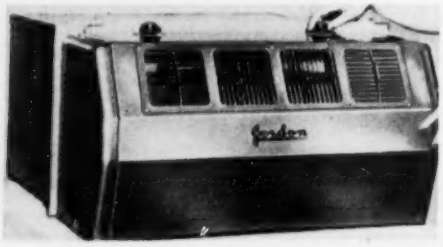
Sound Detector

HPAC 5**—Stethoscope-type tool for locating and diagnosing mechanical troubles . . . "Serviceman Soundscope" consists of an ear-piece containing a sound-box and transmitter with a sensitive diaphragm designed to pick up

sounds which cannot be heard by the human ear and amplifying them until they are audible. According to the manufacturer, it can be used for detecting mechanical imperfections such as leaking valves, defective bellows, wrist pin and bearing knocks, piston slaps, etc. [Manufacturer: Marsh Instrument Co., Skokie, Ill.]

Air Conditioner and DeHumidifier

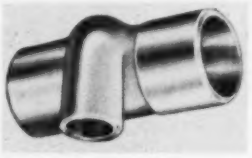
HPAC 6**—Two new products mark entry of firm into air conditioning and dehumidification fields. . . . The room air conditioner is a ¾ hp model with a four-way adjustable air flow through movable air vents on the face of the unit. The air vents can be adjusted to direct the flow of air. Each unit comes with an installation kit. The dehumidifier is furnished with four ball-bearing casters and



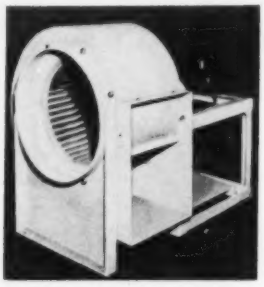
can be wheeled from room to room or can be carried. The manufacturer states that in 24 hours this unit can withdraw approximately 11 quarts of water from the atmosphere in a room of 8000 cu ft. [Manufacturer: Jordon Sales Co., Philadelphia.]

Circulating Tee

HPAC 7**—Circulating tee for one-pipe hot water heating systems . . . . The manufacturer states that it is completely different from preceding tees and has no added or moving parts. The design is said to provide high efficiency vortex venturi action coupled with simplicity of design. [Manufacturer: Hi-Flow Products, Inc., Lindenhurst, Long Island, N. Y.]



Above: Tee



Right: Blower

Blower-Exhauster

HPAC 8—Blower-exhauster designed to solve ventilating, smoke, heat and fume removal problems for industrial plants, hotels, restaurants, hospitals and schools . . . . This exhauster does not require a cabinet, and can be fastened directly to a wall in an out-of-the-way location. The angle of discharge can be adjusted to any degree. [Manufacturer: The Brundage Co., 520 N. Park St., Kalamazoo 11, Mich.]

Suspended Gas Fired Unit

HPAC 9*—Addition of suspended gas fired unit to company's line of space heaters. . . . It is suitable for natural, manufactured, mixed, liquid petroleum, sewage or coke-oven gas and available with input capacities ranging from 85,000 to 215,000 Btu per hr. The "Model D" unit heater comes with a standard fan and "Model DB"

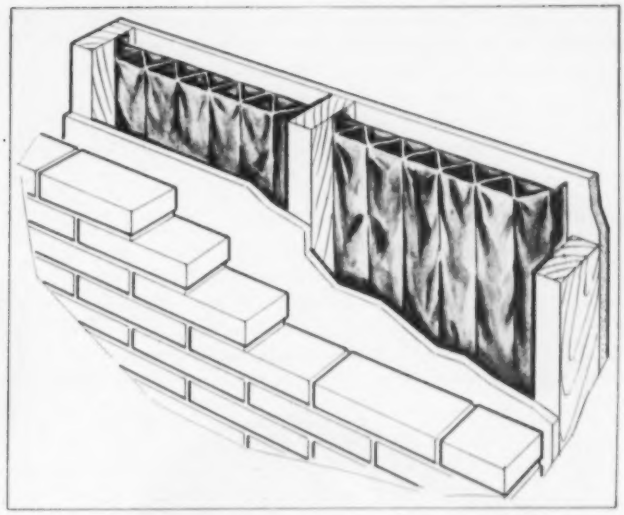
with squirrel-cage blower for short duct runs. "Model DD," without blower, is designed as a heating unit to be built directly into air conditioning duct systems. According to the manufacturer, the cast-iron bunsen type burner assembly can be removed quickly for servicing and cleaning. The drawer frame slides out with the mounted burners and all controls. [Manufacturer: Dravo Corp., Machinery Div., 1203 Dravo Bldg., Pittsburgh 22.]

Silver-Bearing Stainless Steel Solder

HPAC 10—High capillary silver-bearing stainless steel solder applicable with a soldering iron or torch at 430 F. . . . According to the manufacturer, the deposited solder has a color that closely matches stainless steel and remains stable. The deposit is non-toxic and is not brittle. Movement of the plastic joint does not affect solidus strength.

METALS ARE THE BEST INSULATORS

Against Heat and Cold in Building Spaces



Ordinary iron is about 4 times better insulation in an air space against heat rays than asbestos, asphalt paper, brick, plaster, wood, slate, tile, rockwool, enamel. Brass, gold, silver, and ALUMINUM are 20 times better.

Multiple sheets of metal, suspended in space, and spaced apart, make the best barrier to heat and vapor flow. *Infra Multiple Accordion Aluminum, Types 6, 4 and 4 Jr., a commercial form of this construction, has been made familiar to architects and builders through advertising which appears in every issue of Architectural Record; Progressive Architecture; American Builder; Practical Builder; Heating, Piping & Air-Conditioning; Heating & Ventilating; Roofing, Siding & Insulation; Masonry Building.*

Space has slight density, therefore heat flow by CONDUCTION is slight through the spaces inside a building wall, a roof, attic or under a floor. CONVECTION, which otherwise causes 15% to 20% heat flow in space sideways, and 25% to 40% upwards, is blocked by metals in space. RADIATION, responsible for 65% to 85% heat flow in space sideways and 55% to 75% upwards, is absorbed and emitted least by metal surfaces; only about 3% with aluminum but over 90% with most building materials, including ordinary insulation.

INFRA THERMAL FACTORS, TYPE 6

Up-Heat C.089, R 11.23 = 4⅓" dry rockwool
Wall-Heat, C.073, R 13.69 = 5⅛" dry rockwool
Down-Heat C.044, R 22.72 = 9" dry rockwool

Infra Insulation, Inc.
525 Broadway, New York, N. Y.
Telephone: Worth 4-2241

The tough aluminum sheets which make up Infra have zero permeability to water vapor. Because of Infra's composition and scientific structure, it is virtually non-condensation forming, for a dew-point is not reached on any of its surfaces or inside.

Dealers like Infra because its lightness and compactness minimize storage and handling problems in the yard and at the building site and reduce freight and delivery charges. 1000 sq. ft. of Infra Type 4 occupies ONE carton of 1¼ cu. ft. weighing 46 lbs. against 25 cartons, totaling 175 cu. ft. and weighing 2,000 lbs. for 1,000 sq. ft. of many ordinary insulations. A passenger automobile will carry 17,000 sq. ft. of Infra Type 4 comfortably—5 cartons in the trunk compartment, 2 on the front seat, 10 on the rear seat and floor. **It would take a standard railway freight car to hold the same amount of many ordinary insulations!**

Get the facts you should know about heat and vapor flow from Schwartz's "Simplified Physics of Vapor and Thermal Insulation", a manual so authoritative that numerous colleges and engineering schools use it in class, so simple and interesting that hundreds of thousands of copies have been requested by architects, engineers, builders, contractors and building supply houses. Fill out coupon below for your FREE copy.

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Please send me free ☐ Schwartz's "Simplified Physics"; ☐ Infra samples; ☐ Infra prices.
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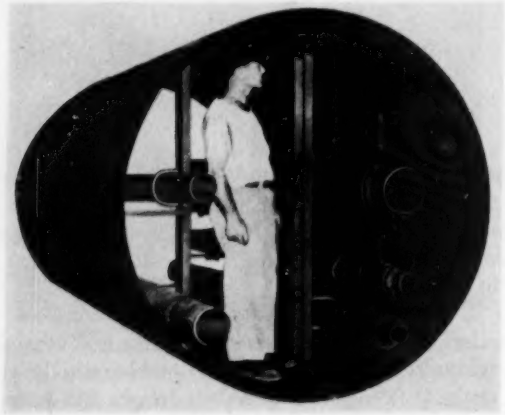
Firm_____
Kind of business_____
Address_____

Recommended applications include high conductivity electrical connections, corrosion resistant assemblies and fabrications to operate at temperatures too high for lead-tin solders, and use on copper tubing, refrigeration coils, etc., where contact is made with foodstuffs. [Manufacturer: All-State Welding Alloys Co., Inc., White Plains, N.Y.]

Underground Tunnel Piping System

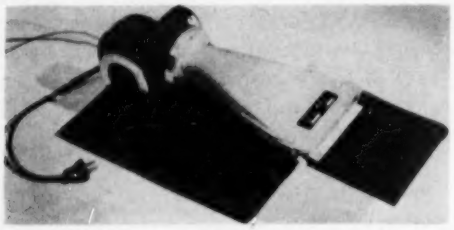
HPAC 11—Large diameter conduit system for protection of underground distribution piping and other utility services. . . . "Utilidor" is prefabricated with distribution piping for steam, condensate, water lines, fire lines. Provision may be made for electrical and communication cables, ceiling lights, etc. Conduit diameters range from



36 in. to 84 in., depending on the nature and number of services to be housed. Walk-through space may be provided in large-diameter units. The housing is constructed of corrugated ingot iron conduit, hot-dip galvanized and protected with asphaltic or phenolic resin coatings. [Manufacturer: The Ric-wil Co., Union Commerce Bldg., Cleveland 14.]

Hemispherical Thermal Radiometer

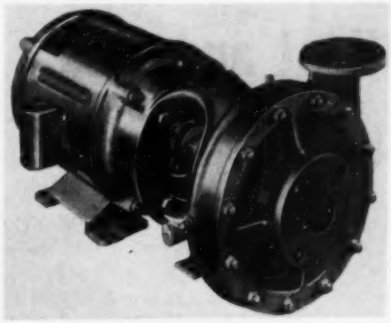
HPAC 12*—"Model 188" hemispherical radiometer for total hemispherical or net-exchange radiant heat measurements by direct electrical means . . . . The unit comprises a thermopile heatflow meter mounted adjacent to a slotted



orifice attached to the discharge of a small air blower designed to eliminate convection effects at the heatflow transducer. For use as a total-hemispherical radiometer, a double shield is provided below the transducer. For net-exchange measurements, both the upper and lower surfaces of the transducer are blackened uniformly. Among its applications are the study of cooling or heating loads in buildings and snow melting rates. [Manufacturer: Beckman & Whiteley, Inc., 1002 San Carlos Ave., San Carlos, Calif.]

Mechanical Seal for Centrifugal Pump

HPAC 13*—"Remite" floating seat mechanical seal for Series 1531 "Uni-Built" centrifugal pumps . . . . The seal, which is designed to eliminate leakage, is made of a composition of materials and is almost as hard as a diamond. The manufacturer states it is wearproof, corrosion resistant and self lubricating. Synthetic rubber bellows seal the shaft. [Manufacturer: Bell & Gossett., Morton Grove, Ill.]



Pump

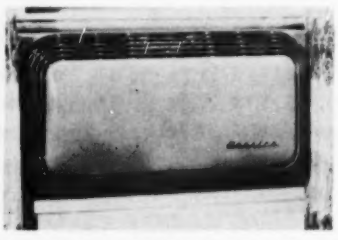
Valve

Temperature and Pressure Relief Valves

HPAC 14—"Econo-Therm Type V" automatic reseating temperature and pressure relief valve for hot water storage heaters. . . . The temperature actuated mechanism contains no fluids and withstands high temperature without deterioration, the manufacturer states. It acts as a thermostat, opening the valve when water reaches 208 F and closing drip tight when the water has become cool. The valves are available in either the regular or stem type with or without try levers. The regular valve is for ordinary hot water storage heater installation and the stem type is recommended for electric heaters, insulated tanks and installations where close nipples cannot be used. Standard factory pressure relief setting is 125 lb and standard temperature setting, 208 F. Other settings are available. [Manufacturer: A. W. Cash Valve Mfg. Corp., Wabash and Morgan, Decatur 60, Ill.]

Room Air Conditioners

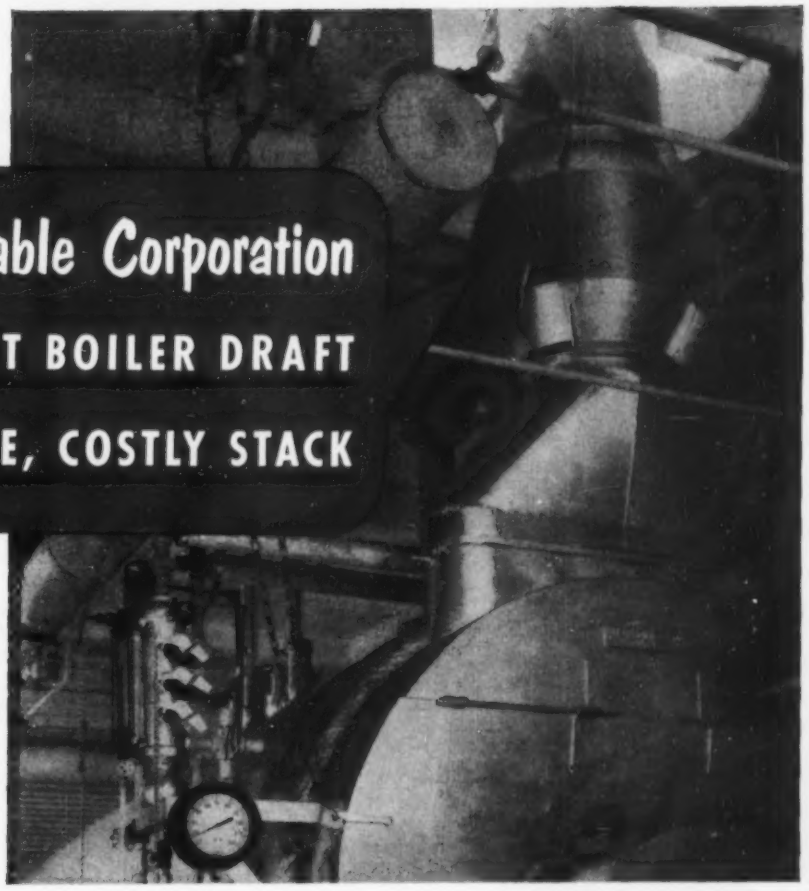
HPAC 15—New 1953 line of room air conditioners which cool the air twice. . . . They are available in 10 models. Window units will be 1/3, ½, ¾ and 1 hp sizes, with thermostatic models in the two larger sizes. Console models will be 1 and 1½ hp with 1 and 2 hp models providing water cooled condensing for applications where an outside air supply is unavailable. All models draw the air



to be conditioned through the front grille and cool, dehumidify and filter it twice before releasing it into the

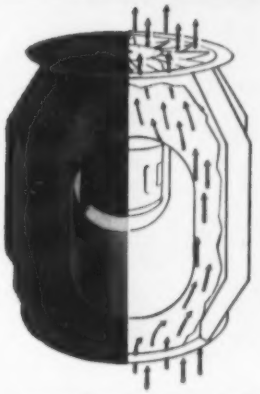
[*Continued on page 236*]

HOW Rome Cable Corporation GETS CONSTANT BOILER DRAFT WITHOUT LARGE, COSTLY STACK



INSTALLING a 120 HP gas-fired boiler in their plant at Torrance, California, for heating plating tanks, Rome Cable Corporation was faced with the problem of providing for proper boiler draft.

So-called "natural" draft would have required a stack 60 feet high, but from the point of view of appearance and expense this was not desirable, and anyway space was not available for constructing such a stack. The problem was neatly solved by installing one compact DeBothezat Induced Draft Bifurcator Fan in the breeching immediately above the boiler. A two-stage unit, with 21" fan wheels and ½ HP totally enclosed variable speed motor, this Induced Draft Bifurcator provides controlled draft at all times regardless of weather conditions. Boiler and fan unit are in operation 20 hours a day, 5 days a week.



HOW BIFURCATOR WORKS

The Induced Draft Bifurcator is a motor driven axial-flow fan in a divided housing. Motor is in an isolated chamber around which flue gases are bypassed (bifurcated) so that the motor always remains cool, clean and accessible. Induced Draft Bifurcators are built in twenty-four sizes, for high pressure boilers delivering up to 60,000 pounds of steam per hour and for low pressure boilers rated up to 190,000 EDR. Ask your DeBothezat representative or write our factory, Dept. HP-553, for illustrated catalog DB-32-52.

DeBothezat Fans

Division of American Machine and Metals, Inc.
EAST MOLINE, ILLINOIS

Fig. 97
Formed Steel
Approved by
Underwriters'
Laboratories
and Factory
Mutual
Laboratories.

Fig. 352
Malleable Iron
Approved by
Underwriters'
Laboratories and
Factory Mutual
Laboratories.

Fig. 392
Malleable Iron
Adjustable,
I Beam Flange.

DOUBLE CHECK
the time cost of
assembling pipe
hangers with the pipe.

GRABLER
Square "Gee" Pipe Hangers

GIVE RELIEF FROM TIME-WASTING GRIEF

Fig. 315
Malleable Iron Approved by
Underwriters' Laboratories
and Factory
Mutual Laboratories.

Fig. 317
Malleable Iron.

Fig. 65
Malleable Iron.

Fig. 103
Cast Iron Roller
Malleable Socket.

Pipe hangers can be time-cost saving tools! A double check of time-cost records where Square "Gee" Pipe Hangers were used will reveal time-cost savings. Designed and fabricated to comply with modern engineering and construction practices, Grabler Square "Gee" Pipe Hangers truly give relief from time-wasting grief. Grabler Pipe Hanger Catalog J illustrates and lists many types. Ask your wholesaler for Grabler Square "Gee" Pipe Hangers.

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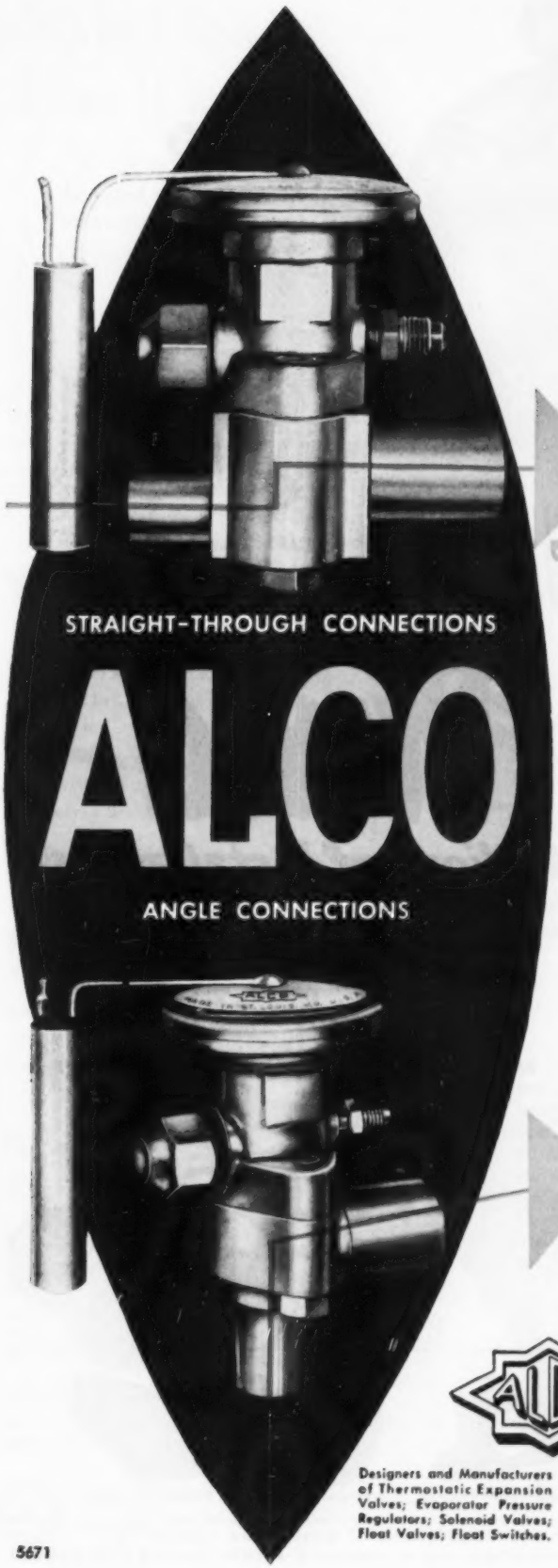

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3 Slotted Bolt Holes. Rubber grommets can be used for sound isolation.

4 Absorbent filler holds oil in reservoir and prevents over-lubrication.

5 Split Pressed Steel Housing is light and strong.

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Sgt. 1st Class Einar H. Ingman U. S. Army Medal of Honor

"The sergeant charged alone . . ."

THE REDS IN AMBUSH on the ridge had lain concealed, withholding their fire. Now they opened up. The two squads were trapped. Their leaders were wounded; others were dropping.

Sgt. Ingman took command. He reorganized the survivors, assigned fields of fire, encouraged the men to fight. A red machine gun opened fire. The sergeant charged it alone, neutralizing it with a grenade.

Then he tackled another gun. A grenade and a burst of fire knocked him down, badly wounded. He got up, reached the gun, and dispatched the entire crew. When his squad reached him, they found Sergeant Ingman unconscious—but 100 of the enemy fleeing in panic.

"Bucking the Communists," says Sergeant Ingman, "takes an awful lot of staying power. The G.I.'s have got it. You have, too, when you invest part of your hard-earned pay *regularly* in Bonds."

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Peace is for the strong!
For peace and prosperity save with U.S. Defense Bonds!

Now E Bonds pay 3%! Now, improved Series E Bonds start paying interest after 6 months. And average 3% interest, compounded semi-annually when held to maturity! Also, all *maturing* E Bonds automatically *go on* earning—at the new rate—for 10 *more* years. $18.75 can pay back $33.67. $37.50 pays $67.34. And so on. Today, start investing in U. S. Series E Defense Bonds through the Payroll Savings Plan at work.

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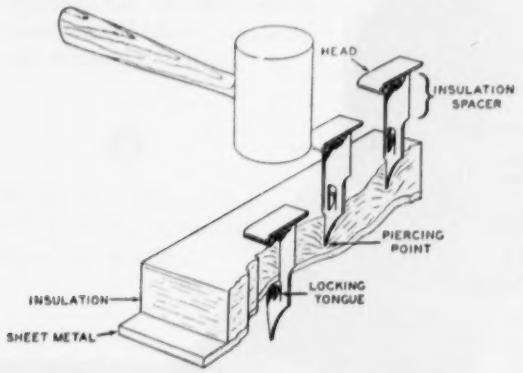
[*Continued from page 230*]

room. When the window units are installed, the grille projects into the room no farther than the line of the drapes, the company states. This is possible because air enters or leaves only through front or back panels, eliminating air inlet and outlet grilles from the sides, top and bottom. These window units can be built into walls, bookcases, etc. [Manufacturer: Carrier Corp., 302 S. Geddes St., Syracuse 1, N.Y.]

Clips for Duct and Roof Insulation

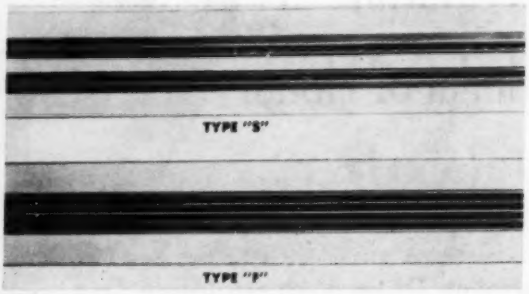
HPAC 16*—Mechanical fasteners for anchoring rigid and semi-rigid insulation to steel roof decks, and sheet metal heating, ventilating and air conditioning ducts . . .



"Lexsuco" clips are driven in with a hammer and lock the insulation in place with a special locking tongue. Made of hardened alloy steel, they are treated to be rust resistant. [Manufacturer: The Lexington Supply Co., 4815 Lexington Ave., Cleveland 3.]

Continuous Air Diffusers

HPAC 17—"Agitair Stripline" continuous air diffusers with built in diffusing vanes . . . The units employ a patented vaned principle of air distribution designed to



produce high turbulence, aspiration and rapid temperature equalization. The manufacturer states that these diffusers insure a continuous blanket of unvaried air over a predetermined area without any noticeable air motion, thereby eliminating drafts or hot or cold spots in the zone of occupancy. [Manufacturer: Air Devices Inc., 17 E. 42nd St., New York 17.]

Window Type Room Air Conditioner

HPAC 18*—Window type room air conditioners that cool, dehumidify, exhaust and ventilate. . . . Known as "Model 2050," the units are available in ½, ¾ and 1 hp sizes. A rotary type compressor with "Freon" refrigerant

AN ENTIRELY *NEW* CONCEPTION IN
Dual Fuel Burners

The "Forerunner" of New Gas/Oil Burner Design

MODEL FAN-AIR MGO-3: 50 H.P. GAS OR OIL
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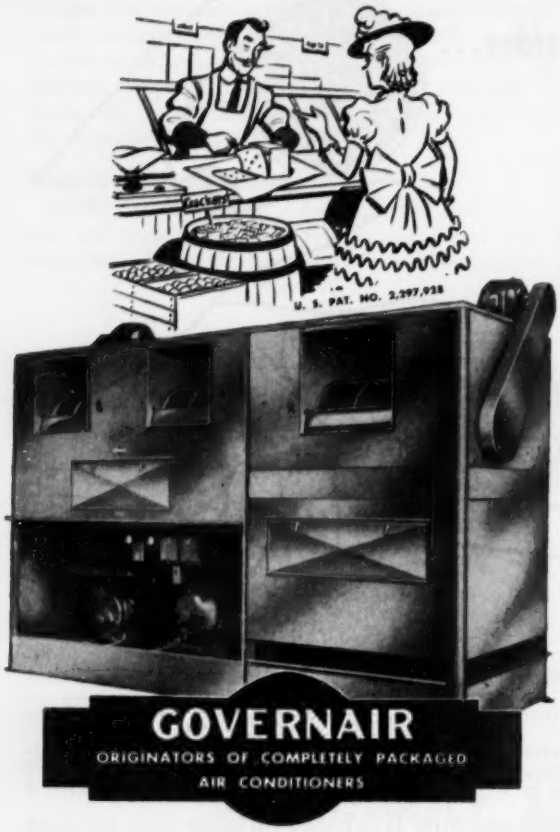
Packaging has improved lots of things



Packaging makes many products more efficient, more convenient and more acceptable these days. And large size packaged air conditioners (up to 60 tons) are no exception!

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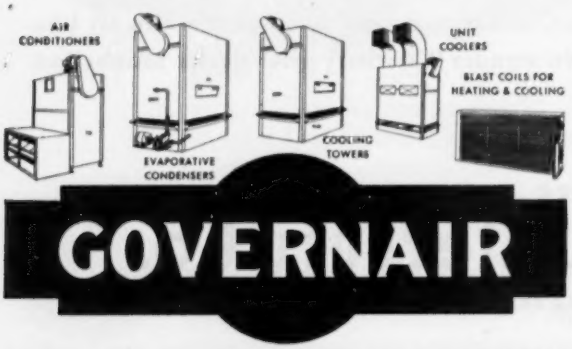
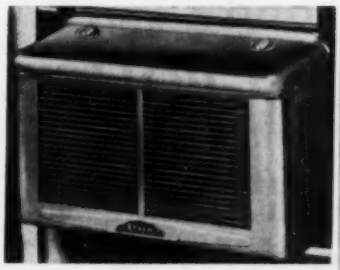
If you want a package deal that will do a better job of air conditioning for you choose Governair! Sized from 3 to 60 tons. GOVERNAIR CORPORATION, 513 N. Blackwelder, Oklahoma City, Okla.



is used. A hermetically sealed cooling system is capillary tube controlled and guaranteed for five years. Condenser and evaporator coils with aluminum fin surfaces are of continuous copper tube construction to minimize refrigerant leakage. Fan motors for both the condenser and evaporator coils are said to be permanently lubricated and are mounted on vibration absorbing rubber. Water condensate is removed by sling action of the condenser fan ring. [Manufacturer: Rheem Mfg. Co., 7600 S. Kedzie Ave., Chicago 29.]



Window Unit

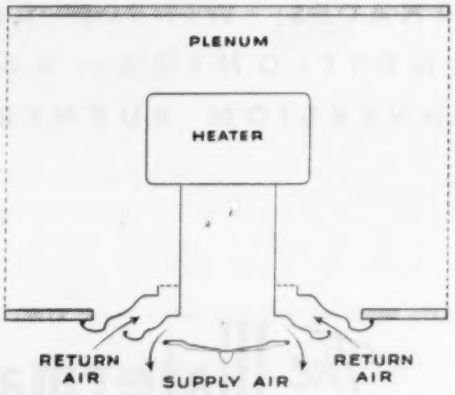
Valve

Check Valve for Fuel Units

HPAC 19**—"Web-Chek" check valve designed to replace the inlet bushing of the Webster fuel unit, becoming an integral part of the unit. . . Used on double and single stage fuel units, it can be installed in the field without requiring pump disassembly, gaskets or pipe dope. No springs are used. The valve features a precision seat ring in a groove, and a ball true within several ten thousandths of an inch, the company states. It is self cleaning. Since the sharpest edges are where the circles meet, the combination of circular seat ring and ball causes an "absolutely tight" closure, according to the manufacturer. [Manufacturer: Hold-Tite Valve Mfg. Co., 550 Fifth Ave., New York 36.]

Air Diffuser for Unit Heater

HPAC 20—"Kno-Draft Type KU" diffuser for attachment to down-blow unit heaters. . . . Discharge is through the inner orifice and return through the outer. Design and adjustment features prevent short-circuiting or merging of the two air streams, the manufacturer states. The combination unit heater and diffuser is used in hard to heat spots, the so-called cold areas, perimeters, vestibules, corridors, etc., which require more warmth than the remainder of the building. Available with supply necks of 11 to 22 in.



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There is a competent Aerofin heat-transfer engineer near you—qualified by intensive training and long experience to find the *right* answer to your own particular heat-exchange problem—and backed by the research and production facilities of the pioneers in light-weight extended surface.

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Installation of DOLE "Ice-Cel" Units in basement of this church, utilizing two 15 H.P. compressors . . . . 80 tons of refrigeration for two and one half hours — or a total of 200 Ton Hours.

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"ICE-CEL" UNITS

diameter, the diffuser fits any standard unit heater. [Manufacturer: Connor Engineering Corp., Danbury, Conn.]

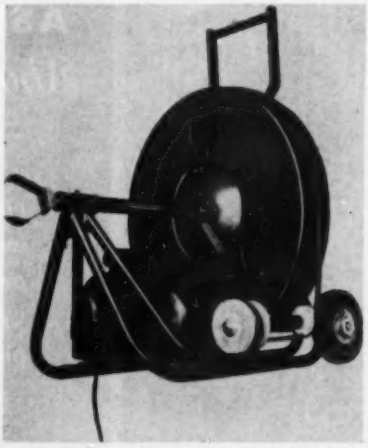
Window Type Conditioner

HPAC 21—"Model 50 WAC" Vornado ½ hp air conditioning unit for cooling, ventilating, circulating, dehumidifying, filtering and exhausting . . . The vortex control combines a high velocity discharge of 1500 fpm of air with maximum cooling to move cool air up to 30 ft into a room, the manufacturer states. The air circulator

can be rotated 360 deg and tilted up or down. The unit allows for gradual regulation of cooling at settings from 6000 to 4900 Btu per hr, permitting removal of up to 21 quarts of moisture from the air on humid days. The unit extends 9½ in. into the room, is installed in double hung sash windows from 23 to 48 in. wide; spacer panels are available for wider windows. [Manufacturer: The O. A. Sutton Corp., 1812 W. Second St., Wichita 2, Kan.]

Waste and Pipe Line Cleaner

HPAC 22**—Electrical driven unit with flexible cable and cutting head cleans rags, rust, grease and other obstructions from pipe lines up to 10 in. in diameter. . . . It can be used in elbows, cross pipes, bends, etc. The unit is supplied with interchangeable cutting heads and cable drum

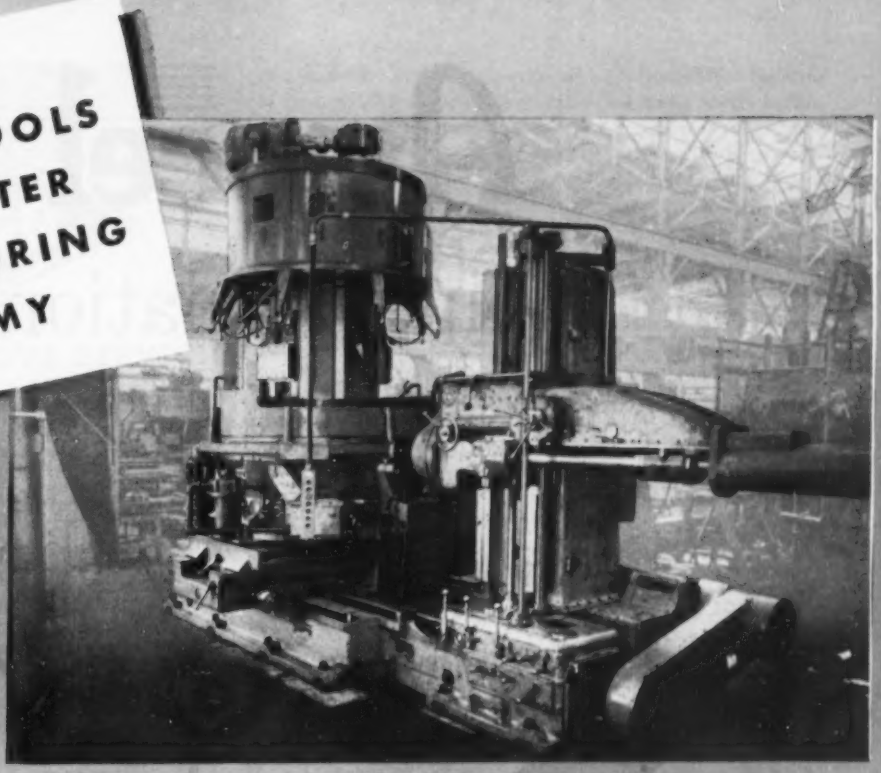


and a foot operated switch. It comes with 110 ft of ¾ in. tempered steel wire cable, four blades and with or without two wheel dolly and vertical motor mount. Additional cable is available for added length. [Manufacturer: Ken-Way Corp., Sparta, Wis.]

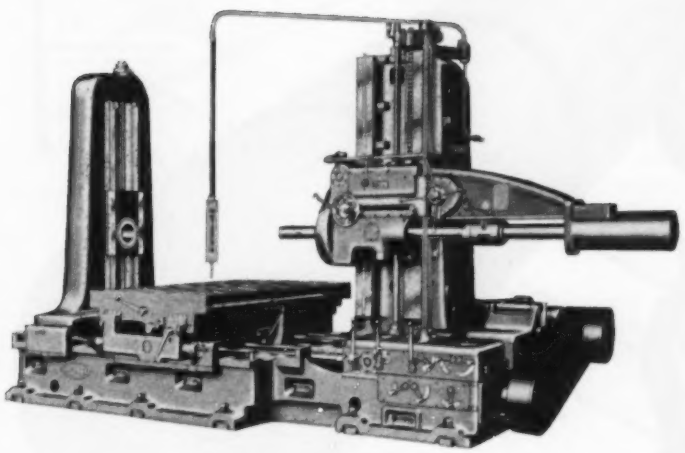
Fiber Glass Duct Liner

HPAC 23—"Flexible Duct Liner" for lining and insulating the interior of air conditioning or warm air ducts. The manufacturer states that the fiber glass insulation has a high noise reduction efficiency and thermal insulating properties which prevent condensation on those ducts

BULLARD MACHINE TOOLS FOR GREATER MANUFACTURING ECONOMY



This 18½-ton Mult-Au-Matic was used to test the load carrying capacities of the Bullard 4-Way Bed Horizontal Boring, Milling and Drilling Machine.



The Table and Saddle were moved in all directions under feed and power traverse with this unusual load. All movements were extremely smooth without any tendency toward sticking or overloading the main drive motor.

This is conclusive proof of the load carrying capacity and operating smoothness of the Bullard 4-Way Bed Horizontal Boring, Milling and Drilling Machine.

BULLARD

Complete information on request.

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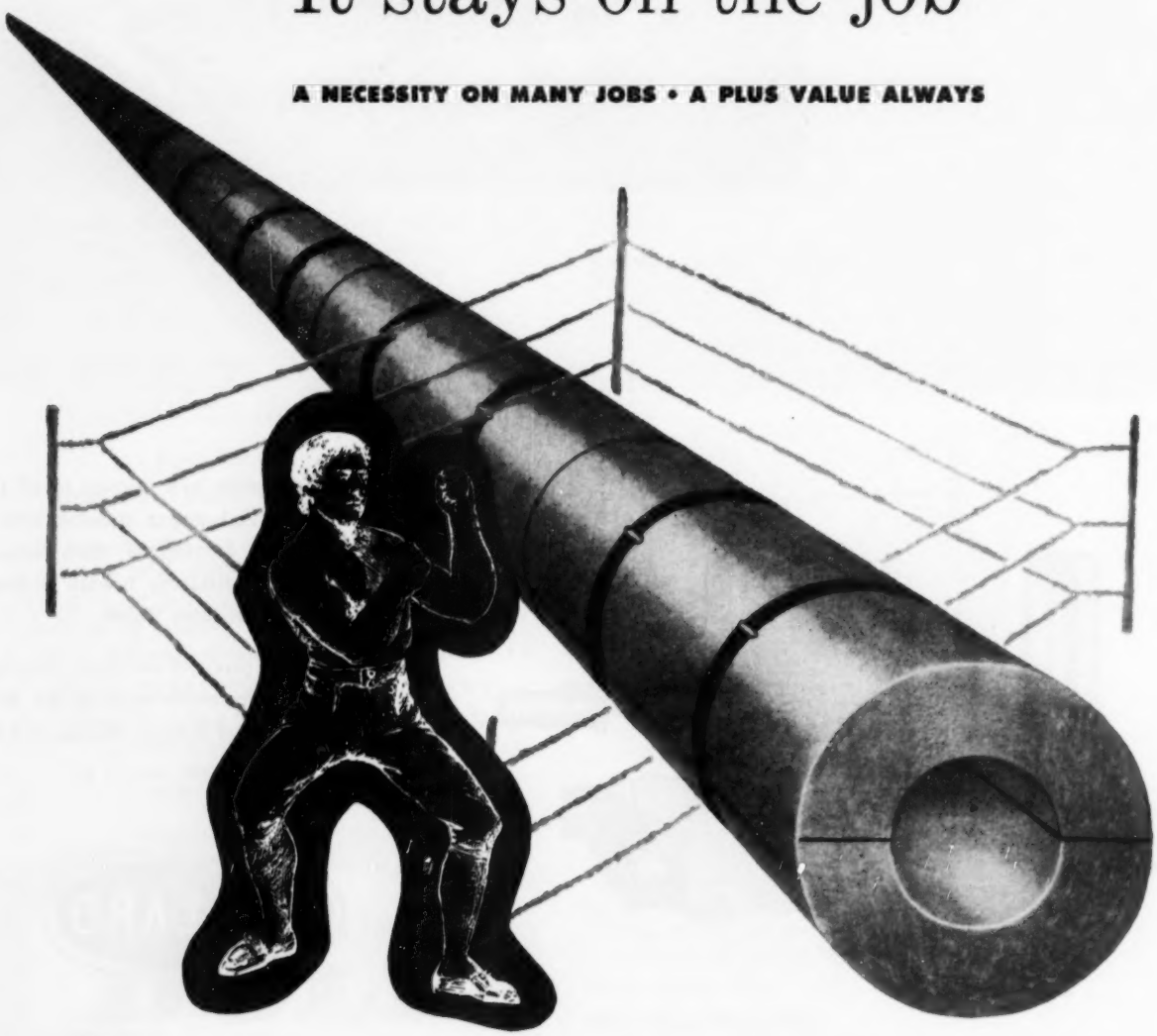
pipe insulation is **rugged** It stays on the job

A NECESSITY ON MANY JOBS • A PLUS VALUE ALWAYS



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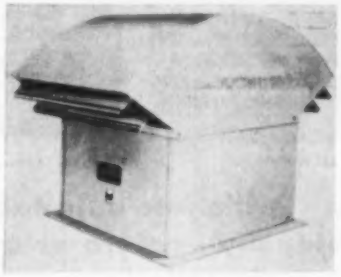
1021 Maryville Pike
LEWISTON, ME.
Eastern Refractories Co., Inc.
60 Holland Street
LIVERPOOL, N. Y.
H. S. Chaffee Company, Inc.
Liverpool Road, RD No. 1
P. O. Box 187
MIAMI
Eagle Insulation Co.
7224 Biscayne Blvd.
MILWAUKEE
Building Service Industrial Sales Co.
315 N. 8th Street
MONTPELIER
Eastern Refractories Co., Inc.
167½ Barre Street
NEW YORK
Eastern Steam Specialty Co.
119 Barclay Street
NORFOLK
C. E. Thurston & Sons, Inc.
32 Commercial Place
PAWTUCKET
Eastern Refractories Co., Inc.
Dunnell Lane
PHILADELPHIA
Supply and Service, Inc.
1428 South Penn Square
PITTSBURGH
Industrial Insulation Co., Inc.
30 Terminal Way
PORTLAND
Armstrong Cork Company
2900 N. W. 29th Avenue
SAN FRANCISCO
Sacomo Manufacturing Co.
38 Bluxome Street
SAVANNAH
North Brothers
644 West River Street
SEATTLE
Armstrong Cork Company
5035 First Avenue, South
SHREVEPORT
The Aber Company, Inc.
P. O. Box 212
SOUTH BEND
Midland Engineering Co.
401 S. Notre Dame Ave.
SPOKANE
Armstrong Cork Company
1318 Maple Street
ST. LOUIS
A. G. Brauer Supply Co.
2100 Washington Ave.
ST. PAUL
Fuel Economy Engineering Co.
510 New York Building
TROY, N. Y.
Eastern Refractories Co., Inc.
33 Brunswick Avenue
TULSA
The Aber Company, Inc.
P. O. Box 2687
WASHINGTON, D. C.
Clarke Baridon
5174 Butler Rd., N. W.
WINTERHAVEN, FLA.
George L. Simonds Co.
1116 5th Street, S.W.
WORCHESTER
Eastern Refractories Co., Inc.
13 Gardner Street

INDUSTRIAL Insulations
PRODUCTS OF
UNION ASBESTOS & RUBBER COMPANY

carrying cool air through areas of high humidity. Because of its flexibility, it may be installed on metal sheets before they are bent to form ducts. The insulation is sprayed with a light coating of fire-safe neoprene to prevent erosion by high-velocity air and to reduce frictional losses. [Manufacturer: Owens-Corning Fiberglas Corp., 1911 Nicholas Bldg., Toledo 1, Ohio.]

Roof Ventilator

HPAC 24—"Power Line Type RVD and RVB" heavy duty roof ventilator for industrial construction. . . . Primarily for exhaust, it can be adapted for fresh air supply. Housing and hood are of heavy gage steel, undercoated with noise deadening material. Automatic built-in louvers act as a backdraft damper. Louvers may be installed at



the base of the unit. Fans are direct or belt drive; motors are totally enclosed or explosion proof. Sizes are 12 to 48 in., 1300 to 20,000 cfm free air, 860 to 14,500 cfm at 1/8 in. static pressure. [Manufacturer: Chelsea Fan & Blower Co., Inc., 639 S. Ave., Plainfield, N.J.]

Electric Dehumidifier

HPAC 25—"Moisture Magnet" automatically removes excess water or moisture from the air of enclosed spaces. . . . Except for an electric outlet, no installation is necessary. No chemicals, ductwork or air outlets are required. Units may be placed over existing floor drains, hooked up to a drainage system, or pails may be used. The dehumidifier comes in a 1 hp compressor model or with a 1½ hp compressor. It is recommended for operation at room temperatures of 60 to 110 F and relative humidities of 40 to 100 percent. [Manufacturer: Remington Air Conditioning Div., Remington Corp., Auburn, N.Y.]

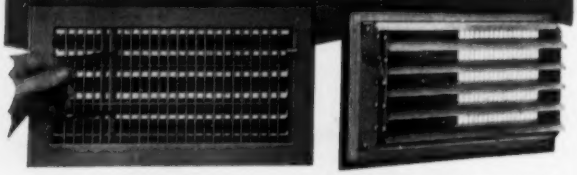
EQUIPMENT BRIEFS . . .

AIR ENTRAINING AGENT for low density concrete and mortar, rigid thermal insulation and light weight building products. Known as "Mearlcrete P," it is a reaction product of hydrolyzed proteins with other chemical additives to provide foam volume and stability. [Manufacturer: Mearl Mfg. Corp., 153 Waverly Pl., New York.]

POROUS STAINLESS STEEL FILTER SHEET which the manufacturer states has double the tensile strength of previously available materials, smooth surface and close control of thickness. Sheet material is available from stock in 0.040 in. thickness with a mean pore opening of 10 microns. Other thicknesses ranging from 0.020 in. up to ⅛ in. are available. [Manufacturer: Micro Metallic Corp., 35 Sea Cliff Ave., Glen Cove, N.Y.]

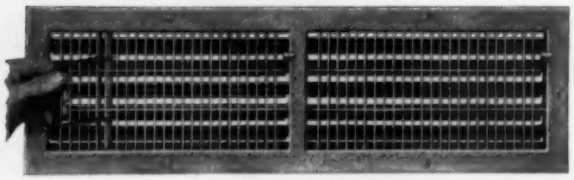
You can get
DIRECTED AIR FLOW
at any angle with

INDEPENDENT
"Fabrikated"
REG. U. S. PAT. OFFICE
AIR CONDITIONING REGISTERS



321-A HMV — Rear View Showing "HMV" Valves

Every grille bar adjustable individually—before or after installation



321-A HMV Tandem

Any direction of air flow—right, left, up, down and any combination—is easily obtained with "Fabrikated" Style No. 321-A HMV air conditioning registers, for residence or commercial installations, on sidewalls or ceiling. The face bars are adjustable to right or left; valves on the back are adjustable to direct the air flow up or down; valves may also be fully closed, and are connected to open or close in unison.

The angles of deflection and the combinations to be had are practically unlimited. Adjustments for directed air flow may be made before or after installation. Grille bars are held firmly in place and will not vibrate or rattle.

"Fabrikated" registers are available in sizes from 8 x 4″ to 48 x 24″, including tandem style. Special sizes can be made without special die set-up charges.

Write for Catalog No. 52.

Always Leading—Always Progressing

THE INDEPENDENT REGISTER CO.
3747 E. 93rd STREET · CLEVELAND, OHIO

WE HEAR THAT . . .

Termination of a seven month strike of 800 production workers at *MODINE MFG. CO.'s* Racine, Wis., plant, has been announced by *CHARLES T. PERKINS*, company president. Striking workers ratified a new contract with the firm, permitting a resumption of production operations which had been suspended since September 25. The company's other plants were not affected by the strike.

OWENS-ILLINOIS GLASS CO. now is selling "Kaylo" heat insulating products to Owens-Corning Fiberglas Corp. According to company officials, the firm will continue to produce the insulation at the Berlin, N.J., plant but will sell the material principally through large accounts with facilities to market nationally.

GOULDS PUMPS, INC., conducted a series of two-day regional engineering sales meetings recently throughout the country to acquaint its branch office salesmen and local distributors with two of the company's new pumps—a single-state, double suction centrifugal pump for general liquid handling and a close-coupled unit for air conditioning service. The meetings were conducted by *CARL FORSHEE*, engineering line sales manager and *PHILLIP OLMSTEAD*, assistant chief engineer.

W. B. Connor Engineering Corp., of Danbury, Conn., manufacturers of ceiling air diffusers and activated carbon air purifiers, has shortened its corporate name to *CONNOR ENGINEERING CORP.*

The *OHIO INJECTOR CO.* of Wadsworth, Ohio, has acquired the lubricated plug valve business of the H. K. Porter Co. The production equipment will be moved this month and company officials say that there will be no lag in the flow of products to distributors.

In a newly constructed plant at Louisville, Ky., the *UNIVERSAL MFG. CO.* soon will begin production of its line of pumps and water systems. The new plant, located at 2114 S. 41st St., will distribute the products through the area east of the Rocky Mountains. Plant manager is *C. E. SUNDELL* and sales manager is *H. J. HOWARD.*

At a recent annual meeting of the stockholders of the *TORRINGTON MFG. CO., PRES. ANDREW GAGARIN* revealed that the firm's three plants had broken all impeller production records during January and February. At the same meeting Mr. Gagarin also announced that plans are being completed for the construction of a new air impeller manufacturing plant at Oakville, Ont.

The first year-round, heating-cooling air conditioning units manufactured by *REMINGTON CORP.* for U.S. Air Force airborne semi-trailers have been delivered to Wright-Patterson Air Base at Dayton, Ohio. Designed and produced under a contract announced last summer, the special units will be used in air-transportable semi-trailers

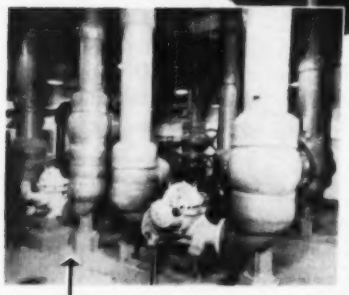
HOW TO SOLVE *an* AIR CONDITIONING PROBLEM:

WHETHER YOU HAVE 3 ROOMS LIKE THIS
—OR WHETHER YOU HAVE 1300 ROOMS
LIKE THE LOS ANGELES
STATLER

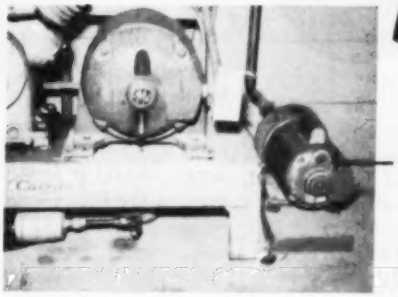
PEERLESS PUMPS

It's all the Same to

THE COMPLETE LINE OF *Peerless* PUMPS



Many a building like the Los Angeles Statler Hotel and office building uses type A pumps like this for air conditioning. *Specifications:* Capacities up to 70,000 gpm; heads up to 300 ft; hp range up to 150 hp; all types of drives.



Many a three room home uses a type PE pump like this for air conditioning. *Specifications:* Face mount and flexible-coupled designs; ¼ to 150 hp; capacities up to 5500 gpm; heads up to 260 ft; all types of drives.

Peerless builds THE BROADEST LINES OF WATER HANDLING PUMPS FOR AIR CONDITIONING OFFERED ANY MANUFACTURER — ***Send for Free Bulletins*** →

PEERLESS PUMP DIVISION

FOOD MACHINERY AND CHEMICAL CORPORATION

Factories: Los Angeles, Calif. and Indianapolis, Indiana.
Offices: New York; Atlanta; Chicago; St. Louis; Indianapolis; Phoenix; Fresno; Los Angeles; Tulsa; Dallas; Plainview; and Lubbock, Texas; Albuquerque, New Mexico.
Distributors in Principal Cities; Consult your Telephone Directory.

PEERLESS PUMPS

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WANT THE LATEST PUMP INFORMATION? MAIL THIS COUPON

PEERLESS PUMP DIVISION
Food Machinery and Chemical Corporation
301 West Avenue 26, Los Angeles 31, Calif.

Please send the Bulletins checked below

☐ TYPE PE PUMP BULLETIN B-2300 ☐ TYPE A PUMP BULLETIN B-1300

Name _____

Company _____

Address _____

City _____ State _____

HP & AC

Sterlco

EXCLUSIVE DESIGN

KEEPS CORROSIVE CONDENSATE from the MOTOR SHAFT

Notice this unique feature on the Sterlco 4100 and 4200 Series Condensation Pumps. The bronze impeller hub completely covers and protects the motor shaft and the carbon type rotary seal runs on the impeller hub and not the motor shaft. This feature protects the motor shaft from corrosion by the condensate.

Sterlco CONDENSATION PUMPS

4200 Series with cast iron tank illustrated. 4100 Series for jobs where steel tank is preferred.

Only two sizes required to take care of all jobs up to 15,000 sq. ft. E.D.R. — and up to 20 lbs. discharge pressure. The easily adjustable float switch, plus other Sterlco features, make this possible . . . and possible only with a Sterlco Pump. *For you* this means less working capital tied up in floor stock. *For your customers* this means a future increase in radiation may not require a new pump.

These exclusive design features, combined with overall RUGGED CONSTRUCTION and LOW COST, make Sterlco PUMPS first choice of the industry. *Send for complete information.*

STERLING, INC.

3732 N. Holton St., Milwaukee 12, Wisconsin

CONDENSATION AND VACUUM PUMPS

HEATING SPECIALTIES

TEMPERATURE CONTROLS

equipped as mobile laboratories. Purpose of the units is to cool and dehumidify automatically the trailer's interior in summer, humidify and heat it in winter, filter out dirt, pollens and foreign matter and provide controlled ventilation and circulation of air.

The *ARAMAC SUPPLY CO.*, wholesale distributors in Cincinnati, is financing an exposition to display the products of 30 manufacturers of heating and plumbing supplies. The trade and public will be invited to the exposition to be held at the Sheraton Gibson Hotel, June 3 and 4.

Prospects for greatly expanded sales in both commercial and domestic humidity control equipment were forecast at the *DRYOMATIC CORP.'s* annual national sales meeting held recently in Chicago. Previewed at the sales meeting was the company's newly designed deep-bed dehumidifier.

The *ARMSTRONG CORK CO.* has announced plans to consolidate all of its corkboard and cork pipe covering production in one plant at Beaver Falls, Pa. The company's other cork insulation plant, located at Camden, N.J., will be placed on a stand-by basis after the consolidation program is completed early in 1954. According to *H. R. PECK*, vice president and general manager of the firm's Building Materials Div., technological improvements in recent years have made it possible for one plant to produce as much as two did several years ago.

The transfer of Burkay commercial water heater manufacture from Toledo to Kankakee has been completed and now is integrated with the Permaglas-Heating Div. of *A. O. SMITH CORP.* In 1948 the A. O. Smith Corp. bought control of the Burkay Co. and moved division headquarters to Toledo. Consolidation of Permaglas Div. and Burkay operations in Kankakee took place in late 1952 and the two operations became known as the Permaglas-Heating Div.

MILLER MFG. CO. of Detroit has acquired full ownership of Bonney Forge & Tool Works, Allentown, Pa. The Bonney firm produces a line of mechanics' hand tools and welded fittings. Under Miller ownership, Bonney management will be directed by *JOSEPH W. McDOUGAL*, president. *ARTHUR J. MALE*, former president, will be chairman of the board. *FRED S. DURHAM, JR.*, a grandson of the founder, will continue as vice president and secretary.

PRES. D. E. ATKIN of *BARBER GAS BURNER CO.* has announced that his firm has purchased the Scott-Newcomb Co. of St. Louis, manufacturers of oil and gas burners. Equipment, inventory and all physical assets are being moved to the Barber firm in Cleveland.

U. S. MACHINE DIV., STEWART-WARNER CORP. presented a series of 11 regional meetings attended by 1300 dealers early this spring to develop a new high of

WE TAKE OUR OWN MEDICINE . . . AND EVERY DAY, TOO!

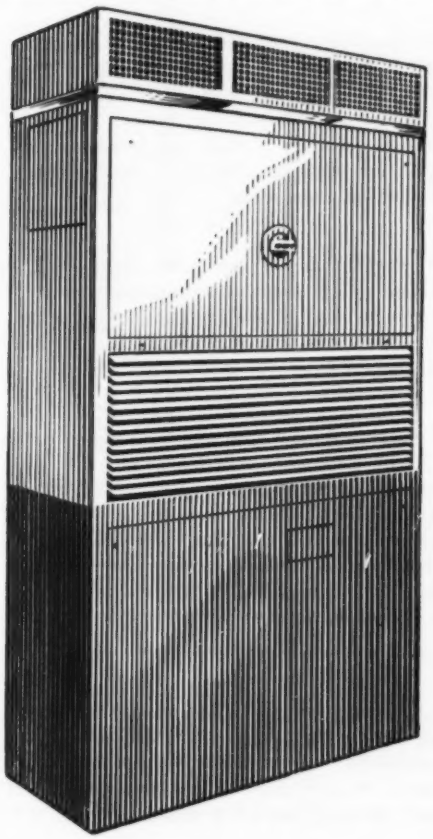
Temperature control is the key to precision manufacturing. That's why every Chrysler Airtemp Compressor is machined, assembled and tested in a completely Air Conditioned Factory!

What's the result? The best air conditioner made today . . . one that gives year after year of trouble-free, dependable operation. Here's why:

- Dust and dirt—enemies of trouble-free operation—cannot get into the compressor during assembly.
- Components do not rust or corrode from contact with moist hands during either manufacture or assembly.
- Tools, jigs and fixtures remain constant regardless of temperature variation . . . thus assuring quality that is always the same day after day.
- True precision assembly . . . better work . . . result from high employee morale at Chrysler Airtemp. This is due to elimination of excessive heat and humidity.

Features like this are your assurance that you're selling the best when you sell Chrysler Airtemp. Get all the facts now.

Comfort Zone FOR PROFIT



"Packaged" Air Conditioners
Six models from 2 to 15 H. P. capacity meet most cooling needs.

Guaranteed by Good Housekeeping

Chrysler Airtemp

AIR CONDITIONING • HEATING
for HOMES, BUSINESS, INDUSTRY
Airtemp Division, Chrysler Corporation, Dayton 1, Ohio

Airtemp Division, Chrysler Corporation HP&AC-5-53
P.O. Box 1037, Dayton 1, Ohio

Please send full details on the Chrysler Airtemp Comfort Zone "Packaged" Air Conditioning proposition.

Name_____

Address_____ Phone_____

City_____ Zone_____ State_____

ALADDIN
Centrifugal
ROOF VENTILATORS

• THIRTEEN SIZES
• BELT CONTAINED
• QUIET OPERATING
• COMPLETE PERFORMANCE DATA

ALADDIN Centrifugal Roof Ventilators are furnished in thirteen sizes... direct and belt driven. Ruggedly built, these units have been designed especially for those installations where positive year around powered ventilation is required.

ALADDIN Roof Ventilators are described in the first complete engineering bulletin yet published on similar units. This bulletin contains full performance tables, characteristic curves and other data required for the proper selection of such equipment.

WRITE FOR BULLETIN 410

ALADDIN HEATING CORPORATION
2272 SAN PABLO AVE., OAKLAND 12, CALIFORNIA
REPRESENTATIVES IN ALL PRINCIPAL CITIES IN THE WEST

interest in "Winkler" heating equipment. Seven executives and department heads, billed as the Winkler Hamateurs, used a vaudeville format to present new sales promotion, advertising materials and introduce new products. *CLAUDE A. POTTS*, general sales manager, advised that the company was geared for its greatest production schedule and predicted sales would top 1952, best in the firm's 16-year history.

The former firm of Bagg & Newkirk now is known as *EGBERT BAGG ASSOCIATES, ARCHITECTS*, and is continuing at the same address, 258 Genesee St., Utica, N.Y.

Warren-Connolly Co., Inc., New York distributors for *WORTHINGTON CORP.*, recently presented the firm's new line of package commercial and residential air conditioners at their showrooms to approximately 350 air conditioning contractors. *PHIL SHAW*, Worthington product manager at the Holyoke, Mass., plant, explained the technical phases of the new line and the national advertising program and sales promotion at the local level.

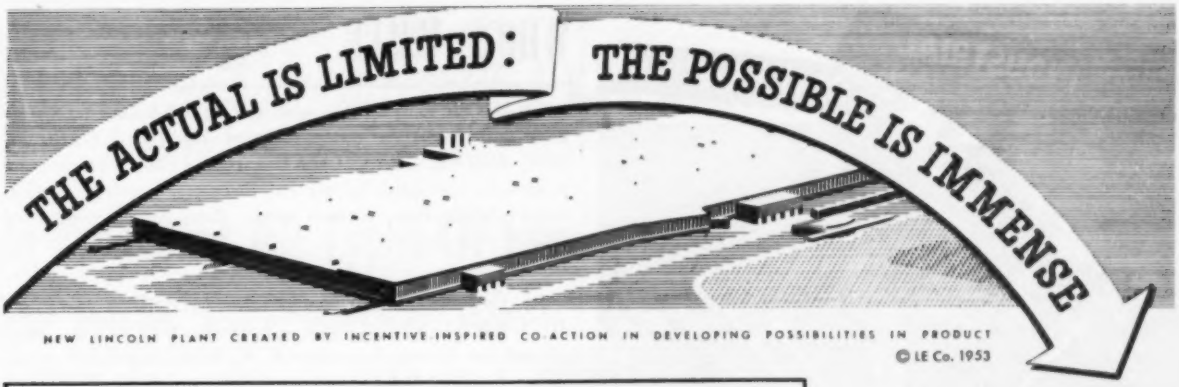
The Controls Mfg. Div. of the *PERFEX CORP.*, formerly located at the main plant in Milwaukee, began operations from Iron Mountain, Mich., last month. The sales, advertising, accounting and engineering departments remain in Milwaukee. Plans call for the moving of the Aircraft Controls Mfg. Div. to Iron Mountain in the near future.

A process for expanding ideas for technical development is described in the booklet, *Putting Ideas to Work*, just issued by the *BATTELLE DEVELOPMENT CORP.*, 505 King Ave., Columbus, Ohio. The booklet explains how the corporation provides a way for free-lance inventors or for research workers in industry and universities to develop their creative ideas.

HERBERT N. EATON, an expert in the fields of hydraulic engineering and aircraft instrumentation, retired several months ago as chief of the Hydraulics Section of the *NATIONAL BUREAU OF STANDARDS*. He had held this position since 1928.

In order to expand West Coast production facilities, *MINNEAPOLIS-HONEYWELL REGULATOR CO.* has begun construction on a new factory that ultimately is expected to employ 2000 persons. Located in Gardena, Calif., near Los Angeles, the new plant will be operated by the firm's appliance controls division. The first unit of the new plant, a machine shop, is expected to be completed by June. Other sections will be erected in progressive stages.

Barnes and Reinecke, Inc., Chicago engineering company, was acquired last month by the *JOY MFG. CO.*, Pittsburgh manufacturer of mining equipment and other industrial products. It will continue to operate under its present name and personnel as a Joy subsidiary.



NEW LINCOLN PLANT CREATED BY INCENTIVE-INSPIRED CO-ACTION IN DEVELOPING POSSIBILITIES IN PRODUCT

© LE Co. 1953

SHIELD ARC'S RIGHT TYPE ARC . . . RIGHT ARC INTENSITY

simplifies pipe installations, cuts costs

Fig. 4. Welds High Pressure Pipe *on refrigeration system for multi-story plant. 12" pipe, bevelled 60° and welded with three passes of Lincoln "Fleetweld 5" electrodes, forms permanent, trouble-free installations.*

MORE Lincoln "Shield-Arcs" are used on piping jobs than any other welder today. And for good reason:

Whether it's flat, vertical or overhead work, top quality welding is easier with "Shield-Arc". Through the Job Selector, the operator sets the *right type* of arc. With the Current Control he sets the right arc intensity. Unlimited combinations instantly available with *Lincoln Dual Control* match the exact welding needs of every job for efficient operation.

Result . . . Each weld produced with "Shield-Arc" has dependable top quality, is made faster . . . at less cost per inch.

Fig. 3. Top Performer. *Lincoln "Shield-Arc" SAE motor driven welder with Self-Indicating Dual Continuous Control. Preferred by contractors and arc welders the world over for fast, easy, low cost performance.*

HOW LINCOLN SAE WELDER SAVES MONEY SAVES TIME CUTS PIPING COSTS

Fig. 1. Simplifies and Speeds Construction *of 8" vertical exhaust line from warm water tank. Joints are bevelled 60° to assure 100% penetration. "Fish-mouth" ends of 4" pipe are laid out to fit contour of 8" pipe by template method before fillet welding with Lincoln "Fleetweld 5".*

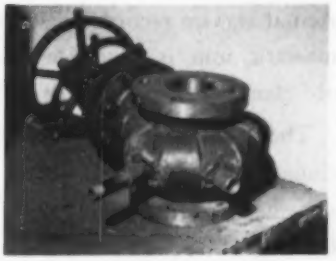


Fig. 2. Adds Steam Jacket *to valve for industrial processing. Jacket is formed by slicing 3" pipe and coping out vee sections before bending and welding with Lincoln "Fleetweld 5".*

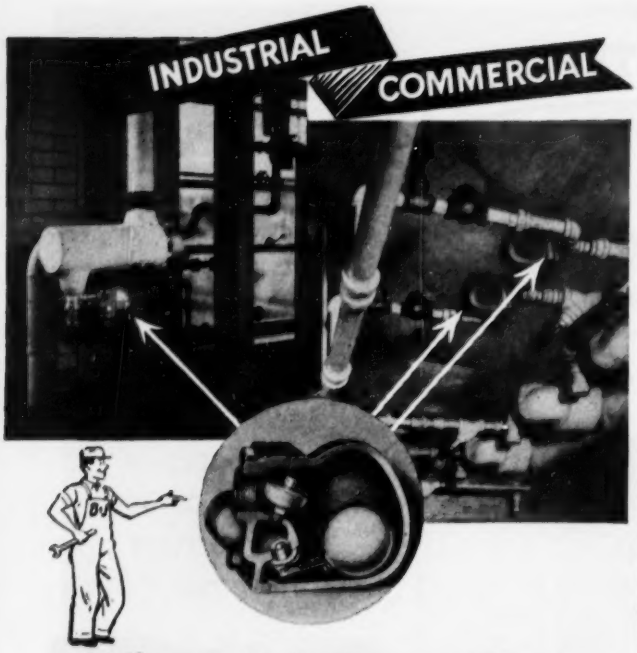
HERE'S HOW

GET THE FACTS—Details on cutting welding costs with "Shield-Arc" are in Bulletin 1302. Write on your letterhead to Dept. 3801.

THE LINCOLN ELECTRIC COMPANY

Cleveland 17, Ohio

THE WORLD'S LARGEST MANUFACTURER OF ARC WELDING EQUIPMENT

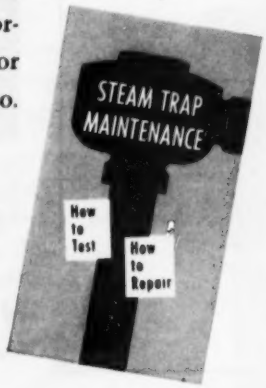


Why B & J Steam Traps are best for the long run

The F & T trap illustrated, for instance, is smaller, fits closer to the ceiling, and the air elimination is accomplished by the famous B & J thermostatic unit. Specially designed for small space installations such as Unit Ventilators.

B & J radiator traps are noted for their long life. Actual service records available. And the same thermostatic unit is available for easy replacement of old elements of practically any make of trap.

The new B & J "Proportionator" Control for vapor systems is worth looking into. Catalog on request.



Ask for the Trap Maintenance Manual, it shows how to test and repair steam traps.

for Quality

B&J Barnes & Jones INCORPORATED

REPRESENTATIVES IN PRINCIPAL CITIES

BOSTON 30, MASSACHUSETTS 7-H

WHO'S WHAT

CHESTER C. YOUNG and *H. GEORGE GREGERSON* have announced the partnership of *YOUNG & GREGERSON ASSOC., CONSULTING ENGINEERS.* Their company will specialize in air conditioning, heating, ventilation, refrigeration, process work, plant improvement and related problems.

At the annual meeting of the *INDUSTRIAL UNIT HEATER ASSOCIATION*, the following officers were elected for the ensuing year: *W. G. SCHLICHTING*, president; *G. A. MATHIS*, vice president, and *L. O. MONROE*, secretary-treasurer. Mr. Schlichting is sales manager of the Heating, Cooling and Air Conditioning Div. of the Young Radiator Co. Mr. Mathis is vice president in charge of production of the New York Blower Co.

JAMES R. WILLIAMS has been appointed manager of advertising and sales promotion for the Delco Appliance Div. of *GENERAL MOTORS CORP.* He has been a member of the Delco advertising department since 1949.

MORRISON STEEL PRODUCTS, INC., has announced the appointment of *JACK SEARLS* as manager of products sales, a newly created position. Mr. Searls was formerly vice president in charge of sales for the White-Rodgers Electric Co.

AMERICAN BLOWER CORP. announces that *J. W. RUFF* has been appointed director of purchases, succeeding *R. S. READE*, who has been made director of purchases for *AMERICAN RADIATOR AND STANDARD SANITARY CORP.*, the parent organization.

CRANE CO. has named *V. P. RUMELY* as senior vice president, manufacturing, and *L. N. BLUGERMAN* as vice president. Mr. Rumely will have charge of production in the company's plants at Chicago and Chattanooga, Tenn. He was formerly vice president of manufacturing. Mr. Blugerman will supervise the Chicago works and Chattanooga division, and will coordinate manufacturing operations in all the plants of the company's subsidiaries. He previously was executive assistant of the firm.

DWIGHT H. RUH has been appointed general sales manager of *SALL MOUNTAIN CO.* Mr. Ruh will supervise sales from the company's main office at the plant in Hamilton. He was formerly in charge of sales in the Detroit area.

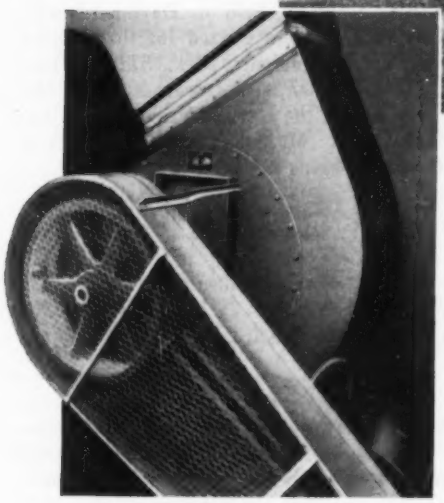
RICHARD K. HULETT has been promoted to assistant industrial sales manager of *IRON FIREMAN MFG. CO.*, Cleveland. Mr. Hulett has been associated with Iron Fireman on the field engineering staff since 1950.

THE BRUNDAGE CO. has announced two changes in personnel. *L. C. KROES* has been appointed assistant

WHERE Bayley EXPERIENCE Pays Off...

In Producing All Types Of Fans for HIGH PRESSURE Air Conditioning . . .

Portion of High Pressure System Exhaust Installed With BAYLEY Fans in St. Francis Hospital, Lynwood, Calif. — Mehring & Hanson, Mechanical Contractors



Type HP Fan

Bayley-designed for High Pressure Air Conditioning Supply

The same seasoned experience and practical knowledge required for successfully handling *low pressure* supply and exhaust fan requirements is equally useful when equipment for HIGH PRESSURE air conditioning operations is needed. In the typical installation pictured here, profitable use was made of the recognized ability of Bayley engineers in *both* of these fields. . . . A case where long experience with low as well as high pressure equipment design combined to achieve highly effective results.

Whether simple or complex, the opportunity to study *your* air handling requirements will always be welcomed by the BAYLEY Engineering staff.

Bayley

Engineered Air-Handling Equipment

BAYLEY BLOWER COMPANY

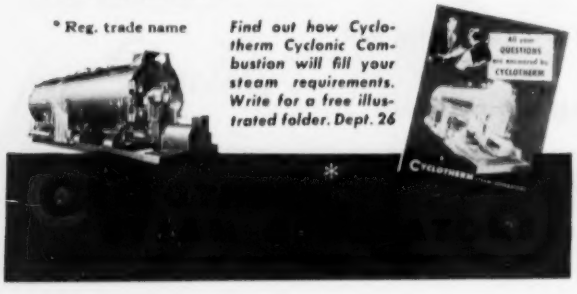
6600 W. BURNHAM ST. MILWAUKEE 14, WIS., U. S. A.

CYCLOTHERM*
CYCLONIC COMBUSTION
PRODUCES MORE STEAM . . .
IN LESS SPACE . . .
AT LOWER COST!

- In multiple installations or as a single unit, a Cyclotherm steam generator is your assurance of quick, dependable steam—plus greater all-round economy.
- You get more power . . . Cyclotherm Cyclonic Combustion flame control required just 3 sq. ft. of heating space per Boiler Horsepower. This means your Cyclotherm delivers 66% *more* steam generating power per sq. ft. than ordinary steam generators of comparable size.
- Cyclotherm steam generators can be conveniently located in any building where steam is required. With only 3 sq. ft. per Boiler Horsepower your Cyclotherm saves up to ⅓ the space of conventional steam generators. Installation is easier because each Cyclotherm arrives complete . . . connect fuel, electricity, water and a simple flue and it's ready to generate steam. Controls are fully automatic.
- A guaranteed *minimum* efficiency of 80% saves on fuel—gas, oil or combination—and lowers maintenance costs. Cyclotherm gives you full power from a cold start in 15 to 20 minutes. In multiple installations, an automatic battery control panel distributes the load for maximum operating economy.
- Cyclotherm steam generators are designed for 18 to 500 h.p., 15 to 200 psi operating pressures. Approved —ASME, National Board Standard, and Underwriters Laboratories, Inc.

* Reg. trade name

Find out how Cyclotherm Cyclonic Combustion will fill your steam requirements. Write for a free illustrated folder. Dept. 26



sales manager. He will assist in intensifying sales coverage, sales training, and in publicity, advertising and sales promotion. *HAROLD AUSTIN* has been promoted to sales and application engineer. His duties will include special assignments with furnace and air conditioning manufacturers on the application of Brundage products.

WILLIAM L. VAUGHN is the new purchasing agent for the Air Conditioning Div. of *REMINGTON CORP.* He will supervise procurement of all manufacturing materials. Mr. Vaughn was previously a buyer for the Eclipse Machine Div. of Bendix Aviation Corp.

GENERAL CONTROLS CO. has announced the appointment of *ROBERT M. JOHNSON* as southern California sales manager. As head of one of the largest of the 34 regional offices, Mr. Johnson will supervise manufacturer, dealer and other customer relations.

At the annual meeting of the *PROPELLER FAN MANUFACTURERS' ASSOCIATION*, held in Daytona Beach, Fla., the following officers were elected for the ensuing year: *E. C. ENGLERT*, president; *E. J. STONE*, vice president, and *L. O. MONROE*, secretary-treasurer. Mr. Englert is vice president of the Hartzell Propeller Fan Co. Div. of Castle Hills Corp. Mr. Stone is sales manager of the Propellair Div. of Robbins & Myers, Inc.

WILLIAM J. HEALY, sales manager of the De Laval turbine division, has been appointed to the additional position of sales manager for the blower and compressor division of *DE LAVAL STEAM TURBINE CO.* Mr. Healy has been with the De Laval sales department since 1928.

H. RICHARD NIELSEN has been appointed sales manager of the air conditioning division of *SERVEL, INC.* He will be succeeded as southern regional sales manager by *NILS D. SELLMAN*, who has been air conditioning sales representative in New England for five years. Mr. Nielsen has served as southern regional air conditioning manager for the past two years.

FAIRBANKS, MORSE & CO. has elected *J. A. CUNEO* to the board of directors. Mr. Cuneo has been with the company since 1929 and has served as general sales manager of the company for the last two years. *ORREN S. LESLIE* was elected vice president in charge of manufacturing and *G. J. MALONE*, formerly controller, was elected vice president-controller.

Other recent changes are: *WILLIAM B. MORSE*, formerly assistant to the manager of the Detroit sales and service branch, now is manager succeeding the late *E. J. HAY; B. R. ENG* is assistant comptroller; *J. E. McQUILKIN*, formerly general auditor, now is assistant to the president of the Canadian company; *FRANK M. MASON, JR.*, formerly director of engineering, now is coordinator of U. S. government business; *J. F. WEIFFENBACH*, formerly with the Canadian Locomotive Co., Ltd. now is chief product engineer, manufacturing division; *W. E. WATSON* is works manager, Canadian Locomotive Co.,

WR-38

MEET BRYANT'S NEW "Command-Aire" TWINS

. . . now in mass production to make year 'round home conditioning a mass-market sales opportunity . . . for you!

Home builders and home buyers everywhere are enthusiastic about the new Bryant "Command-Aire" Twins. Here's why:

- They're being mass produced to bring the price of *complete* home comfort within the budget of *average* home buyers . . . *30 to 50% less than heretofore!*
- They're independent heating and cooling units matched in appearance and size. Builders can install the furnace first and offer the addition of air conditioning immediately, or later, according to the convenience of the buyer.
- They're being aggressively promoted on national and local levels—even right on the home site—to presell thousands who will buy homes this year.

Here is a new, big-volume, high-profit sales opportunity for alert heating and air-conditioning dealers!

Homeowners want year 'round conditioning because it adds extra enjoyment . . . extra resale value.

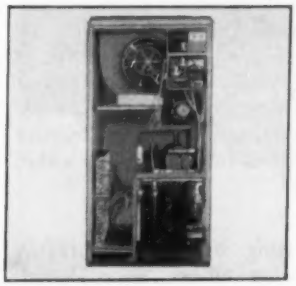
Bryant's "Command-Aire" Twins now make it possible for them to have it at a price millions can afford.

You can be one of the first to profit—by investigating this opportunity today!

Your nearby Bryant Distributor will be happy to provide complete details. Or write direct to Bryant Heater Division, 17825 St. Clair Ave., Cleveland, O.

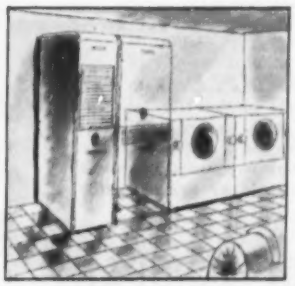
The "Command-Aire" Twins consist of a new Bryant Forced Warm-Air Furnace (*gas* or *oil*) combined with a new self-contained Bryant 2, 3 or 5-ton Air Conditioner. Many combinations of heating and cooling capacities are available.

bryant® *means business... better business for dealers*



Air Conditioner is independent unit with its own blower, filter and controls . . . eliminates need for air to pass through both units . . . improves both heating and cooling efficiency.

Five-year warranty on the hermetically sealed cooling compressors of the 2 and 3-ton "Command-Aire" cooling units . . . has tremendous appeal to prospective buyers.



One cooling unit sells hundreds! Builder can install "Twins" in his model home and leave space for the cooling unit in the others—where your prospects will live.

Powerful promotion presells "Twins"! Extensive national advertising and local publicity and promotion will presell the "Twins" to hundreds in your area.

EASY DOES IT!

-and no more Muddy Mess

This new insulation comes in molded shapes and sizes to fit all ells, tees and 45's in cast iron screwed fittings (½" to 8"), also welded fittings (2" to 8").

The two segments are joined by staples (which we furnish), tape or canvas—and that's all for a clean, neat insulation that fits perfectly. No time is lost, waiting for drying. There's no shrinking, as with cement insulation. And no need to return to point up cracks.

NICOLET *Pre-Formed*

FITTING INSULATION

Will not flake, chip or crack. Immune to moisture, rot, corrosion, odors, insects. Tests indicate a life for the fibers equivalent to more than 150 years of normal service.

SEND FOR FREE SAMPLE. Ask your wholesaler for a free sample of the Nicolet Pre-Formed Fitting Insulation, with descriptive pamphlet and price list. Also, for a catalog of the complete line of Sal-Mo asbestos, sponge and wool felt pipe coverings, sheets, blocks and asbestos cements. Or write:

SALL MOUNTAIN COMPANY

Makers of Fireproofing & Insulating Materials

HAMILTON, OHIO

Ltd; *J. R. WALSH*, formerly manager of the Stuttgart, Ark. works is manager of the new plant in Kansas City; *W. P. McANALLY*, previously supervisor of production at Stuttgart, succeeds Mr. Walsh as manager.

GEORGE I. REYNOLDS, JR., has been appointed assistant director of market development, *U. S. STEEL CORP.* Mr. Reynolds has served as assistant manager, product section, in the company's commercial research division.

As part of the reorganization of the Manufacturing Div., *C. G. WALLIS*, former manager of the headquarters manufacturing department, *WESTINGHOUSE ELECTRIC CORP.*, is now serving as assistant to the vice president. Other appointments include: *L. S. HOUK*, director of works engineering; *N. H. KING* and *R. I. WILSON*, director and assistant director, respectively, of production and inventory control; *G. C. MOORE*, director of plant industrial engineering; *V. D. MACK*, supervisor of manufacturing student training, and *JOSEPH MANUELE*, director of quality control. Heading the newly created manufacturing and equipment engineering department are: *EDWARD GRIFFITHS*, director of expense control; *W. H. DICKINSON*, director of manufacturing engineering; and *G. P. LONGABAUGH*, equipment engineer.

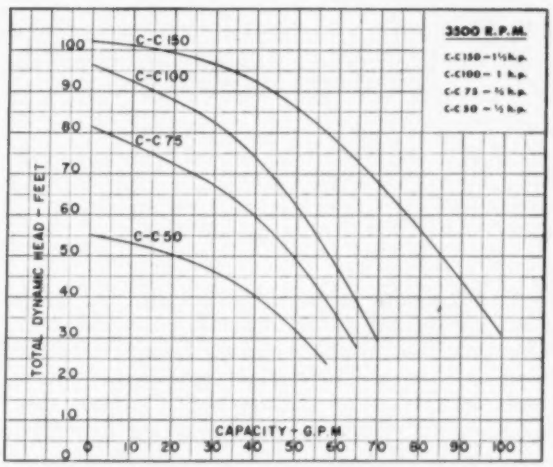
H. R. RYAN is now superintendent of the No. 2 open hearth department of *YOUNGSTOWN SHEET & TUBE CO.'s* Indiana Harbor Works in East Chicago. *ROBERT FRUSHOUR*, formerly with the Edgar Thomson works of United States Steel Co., succeeds Mr. Ryan as superintendent of the firm's Bessemer and open hearth department at the Campbell plant in Youngstown. *DONALD W. LLOYD* succeeds the late *GEORGE W. ABEL* as general superintendent of the steel plant at Indiana Harbor. *THOMAS BRUCE CARPENTER* succeeds Mr. Lloyd as general superintendent of Brier Hill Works; *JAMES W. KIRKPATRICK* succeeds Mr. Carpenter as superintendent of the Brier Hill open hearth department; and *ERNEST B. PLOTT*, former steel plant metallurgist, succeeds Mr. Kirkpatrick as chief metallurgist. *CHARLES T. McCLURE* has joined the company's tube division as superintendent of field engineers. He was formerly with Youngstown Steel Products Co. of California.

BORG-WARNER CORP. has named three new vice presidents: *L. G. PORTER*, treasurer, has been named administrative vice president and treasurer; *R. S. INGERSOLL*, president of the Ingersoll Products Division, Reflectal Corp. and the Petro-Mechanic Research Div., is administrative vice president of the parent corporation; *ROBERT W. MURPHY*, is vice president and general counsel. Mr. Porter and Mr. Ingersoll assume executive supervision of a group of divisions and subsidiaries within the corporation.

At a recent directors' meeting of *REFRIGERATION SYSTEMS, INC.*, the following officers were elected: *DANIEL M. BROWN*, in charge of the Hudson Bay Div., was named vice president; *LAWRENCE H. LAZAR*, chief engineer, is secretary; and *L. CASHIA*, office manager,

New CC CLOSE-COUPLED SERIES PUMPS

Set new performance standards



Each pump operates over the entire range of its curve without motor overload.

The New C-C Series pumps are more than just an improved line—they are an engineering achievement.

They definitely establish entirely new standards in close-coupled pump performance for:

Cooling Towers

Air Conditioning

Chilled Water Circulating

Hot Water Circulating

Pneumatic Water Systems

Booster Systems

The C-C Series pumps combine pump and motor in a single compact unit, eliminating coupling and alignment problems and assuring easy installation.

C-C Series pumps are equipped with a Leak-Proof "Chicago Mechanical Seal" consisting of a fixed-in-place carbon ring on a ceramic seat which is extremely hard and resistant to wear and corrosion. No maintainance or adjustment is necessary. No expensive piping is needed from drip pocket to drain. No messy floors.

See curves above for ½, ¾, 1 and 1½ H.P. models or write for Bulletin 108 F.

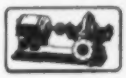
All models in stock for immediate shipment.

CHICAGO PUMP COMPANY

BUILDING and INDUSTRIAL DIVISION

622 DIVERSEY PARKWAY — **CHICAGO 14, ILLINOIS**

Condo-Vac, Sure Return, AVC, LVC, Fire, House & Circulating Pumps Pneumatic & Tankless Water Systems.



Flush-Kleen Sewage Ejectors Little Giant & Non-Clog Bilge Pumps Pumps for every industrial use.

SAVE HOURS, CUT COSTS

ON YOUR PIPING JOBS WITH

GREENLEE PIPE PUSHER

Here's the quick, simple way to install underground pipe. With a GREENLEE Hydraulic Pipe Pusher *one man* pushes pipe *under* streets, walks, tracks, lawns, floors and other obstacles. Cuts job time to a fraction . . . no costly tearing up of paving . . . eliminates extensive ditching, as just a short trench accommodates the Pusher. No tedious tunneling, back-filling, tamping or re-paving. Greatly reduce job time, reduce costs with the GREENLEE which often pays for itself on the first few jobs. Compact, portable, powerful. Get facts today.

Two sizes to fit the exact needs of yours jobs: No. 790, at left, for ¾ to 4-inch pipe. 6,500 to 40,000 lbs. pushing power. No. 795, lower left, for pipe larger than 4-inch, concrete sewer pipe, large drainage ducts. 25,000 to 150,000 lbs. pushing power. Power pump at right for extra ease and speed of operation.

TOOLS FOR CRAFTSMEN

GREENLEE

Greenlee timesaving tools for plumbing and heating work . . . Hydraulic Pipe Benders • Tubing Benders • Hydraulic Pipe Pushers • Pipe Bits • Auger Bits • Spiral Screwdrivers • Chisels and Many More. Write for details. Greenlee Tool Co. 2345 Twelfth Street, Rockford, Illinois.

is treasurer. *ALFRED KAUFMANN*, former vice president and treasurer, has resigned from the company.

RICHARD L. STONE has been named research engineer with the *WILLIAM WALLACE CO.* at the head office in Belmont, Calif. He was formerly a senior research engineer with the AGA Laboratories Research Department.

HARRY E. BEANE has been appointed vice president of sales of the *BRISTOL CO.* He joined the firm in 1920 and was formerly general sales manager.

PAUL R. LOUGHIN, who was named an executive assistant of the *BABCOCK & WILCOX CO.*, last month, has been transferred to the staff of the Boiler Div. in New York. He had been chief of staff engineering since 1947. Mr. Loughin joined the company in 1926 as an apprentice engineer and in 1937 he was appointed the first project and application engineer in the company.

JOHN D. HANTZ is now executive vice president, while *GLENN G. BUZZA* and *CHARLES A. DALLY* are vice presidents of *CONTINENTAL EQUIPMENT CO.*

WYMAN K. ENDER recently joined the products engineering department of the *TRANE CO.* He will work on development of hermetic centrifugal refrigeration units. He was formerly with Douglas Aircraft Co.

J. P. COUGHLIN is the newly appointed manager of the arc welding department of *WESTINGHOUSE ELECTRIC CORP.* He has been with the company since 1939 serving as welding sales engineer, manager of welding products of the agency and specialty sales department, and manager of field sales for the welding department.

DONALD W. TAIT, has been appointed manager of sales promotion for *RAYTHEON MFG. CO.* In this new position he will direct and coordinate all sales promotion activities for the equipment sales division. He was formerly advertising manager for the Perlite division of Great Lakes Carbon Corp.

RUDOLPH SCHNAKENBURG, vice president in charge of finance and secretary, and *JAMES F. DONNELLY*, vice president in charge of sales, were elected to the board of directors of *SERVEL, INC.* at a recent meeting.

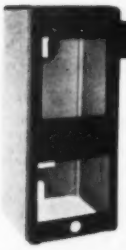
Newly elected members of the board of directors of the *REMINGTON CORP.* include: *CALEB CANDEE BROWN, JR., HERBERT L. LAUBE, MAURICE I. SCHWARTZ, FRED STIDFOLE*, and *M. MARK WATKINS.*

RICHARD N. MATHEWS, newly elected vice president of *KEWANEE-ROSS of CANADA LTD.*, is in charge of new general offices at Toronto. The firm is a division of American Radiator & Standard Sanitary Corp. and is affiliated with Kewanee-Ross Corp. of Kewanee, Ill. and

CUSTOM BUILT— QUANTITY PRICED

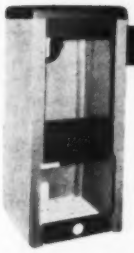
atlas BOILER JACKETS

YES, Atlas combines highest quality with lower costs by using basic styles and eliminating tooling costs. You can get boiler jackets custom built to your specifications from ATLAS at prices that will surprise you. ATLAS offers three flush type boiler jacket styles to meet manufacturers' demands. All are of heavy gauge steel, with baked enamel finish, ready for quick installation. You'll find them all the last word in appearance and value.



ECONOMY

Square type construction is featured in this model. In spite of its fine appearance Economy is competitive in price. Ideal for large scale housing projects where price is a major factor.



QUALITY

The richness of the round-cornered top is combined with the simplicity and economy of the square-cornered body. This style is competitive in price with all standard construction designs.

DELUXE

This fully round-cornered design is Deluxe in every way. The full radius on all corners lends massiveness and beauty to its expensive appearance. Use Deluxe for your select dealer trade at surprisingly low cost.

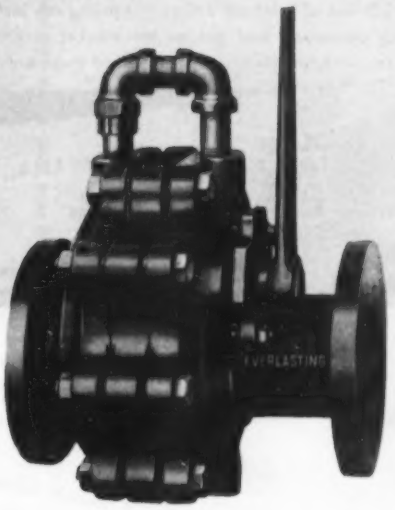
Atlas also manufactures cabinets for heating, cooling and air conditioning units, and furnace cabinets of any style. We will be glad to quote cost estimates on any type of boiler jacket or cabinet on receipt of your specifications and requirements.

Atlas **MANUFACTURING COMPANY**

EUSTIS AT ROBBINS ST. • ST. PAUL 4, MINN.

VISCOUS MATERIALS

flow freely through these valves



Do you handle resins, asphalts, coal tar products, waxes or any other products that congeal at ordinary temperatures?

If so, EVERLASTING Steam Jacketed Valves will definitely end your clogging problems caused by other types of valves.

Users report that even in particularly difficult services, such as molten sulfur, these EVERLASTING Valves operate satisfactorily, after replacing other designs of valves that caused continuous trouble.

The secret is in the exclusive EVERLASTING design of steam jacket and operating mechanism. *For complete explanation write for descriptive bulletin.*

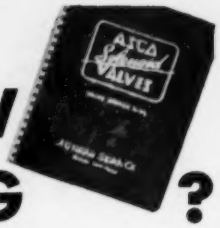
EVERLASTING VALVE CO., 49 FISK STREET, JERSEY CITY 5, N. J.

Everlasting Valves

FOR EVERLASTING PROTECTION

EV376 TRADE MARK "EVERLASTING" REG. U.S. PAT. OFF.

WANT THIS NEW CATALOG?



NEW ASCO CATALOG

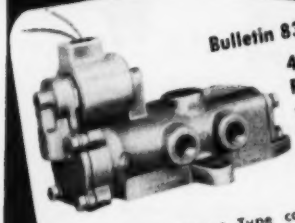
Describes Scores of Solenoid Valves

New Valve Catalog No. 24 brings you up-to-date on the extensive ASCO line of Solenoid Valves (list prices are included). New valves developed and put on the market recently are described in detail for the first time. A few of these are:

Bulletins 8262 and 8314
Midget Size
2 & 3-Way Packless Solenoid Valves

Midget Valves are now available with EXPLOSION-PROOF Solenoids for Class 1, Group D hazardous locations.

2-Way (Normally Open or Normally Closed) — Ports, 1/16" through 3/16"; pressures up to 1000 p.s.i. 3-Way — Ports, 3/64" and 3/32"; pressures up to 125 p.s.i. Time Delay Feature — Valves with 3½-6½ seconds delay also available.



Bulletin 8344
4-Way POPPET TYPE Packless Solenoid Valves

This valve has been thoroughly tested as a control unit in equipment requiring "plus" performance. Valve features:

Reliability — Poppet Type construction means this valve will not stick! Power stroke occurs in both directions — no spring return!

Fast Operation — 500 cycles/minute continuous duty; 750 cycles/minute intermittent duty (air).

Freedom in Mounting — Can be mounted in any position. Available 4 and 5 port; flow metering; standard or manifold mounting; ⅜, ½, ¾, and 1 inch pipe size. Handles air, water, or hydraulic oil; maximum pressure 250 p.s.i.

These two are just examples of new valve data. If you have any need for controlling the flow of liquids or gases in the equipment you are designing or operating, you should find this up-to-date ASCO Valve Catalog useful. Want a copy? Just drop us a note or call up and let us know. We'll be glad to send it to you . . . and extras for your associates if you desire.

ASCO Solenoid VALVES

We manufacture a complete line of Electromagnetic Controls including Automatic Transfer Switches, Remote Control Switches, Contactors, Relays, and complete Control Panels.

V.53.1

Automatic Switch Co.

389 LAKESIDE AVENUE · ORANGE, NEW JERSEY

Buffalo, N. Y. Mr. Mathews was formery West Coast manager with headquarters in San Francisco.

BROWN PRODUCTS CO. has announced the appointment of *HARRY W. GRAY* as general sales manager. He had been associated with H. W. Gray Co. as a manufacturer's representative and professional engineer.

ARMAND A. PROBECK, well-known in the metals industry, has been elected vice president of *SNAP-TITE, INC.*

United States Electrical Tool Div. of the *EMERSON ELECTRIC MFG. CO.* has appointed *RALPH E. KNOWLES*, formerly works manager, Armament Div., as division manager, at Cincinnati, succeeding *HARRY C. LEVENSON*, who has resigned. Mr. Knowles has been with the company for 35 years.

RICHARD M. SCAIFE has been elected a member of the board of directors of *SCAIFE CO.*

W. B. McMILLAN, president and director of the Hussman Refrigerator Co., was recently elected a director of *WAGNER ELECTRIC CORP.* He succeeds the late *CHARLES B. FOX.*

The following appointments have been announced by *INSULATING CASTABLE CORP.*: *JAMES R. CROSBY*, general sales manager; *E. N. WASH*, as general manager.

BRUNNER MFG. CO. has appointed *JOSEPH STRAFELLA*, former assistant purchasing agent, as purchasing agent.

ALBERT W. BROWN and *GEORGE W. RIDDLE* have been appointed industrial engineer and quality control engineer, respectively, by the Air Conditioning Div. of *REMINGTON CORP.* Mr. Brown is in charge of plant layout, processing and production methods, while Mr. Riddle supervises product inspectors and production specifications.

GEORGE D. ELLIS, vice president and controller, *COMBUSTION ENGINEERING-SUPERHEATER, INC.*, has been appointed a director. Mr. Ellis, who has been with the company since 1915, is also a vice president and director of the Superheater Co. Ltd., Canada.

At a recent meeting of the directors of *AVERY PRODUCTS CO.*, *JOHN THOMAS AVERY* was appointed vice president. *JOSEPH E. WILHELM*, treasurer, *ETHEL HASKELL*, secretary and *LESTER T. AVERY*, president, were re-elected.

ALBERT B. DISS has been appointed vice president and general manager, *WATSON-STILLMAN CO., DIV. of*

You'll find these AMERICAN-MARSH Redi-Return Condensation Units

EASY TO INSTALL . . . EASY TO INSPECT

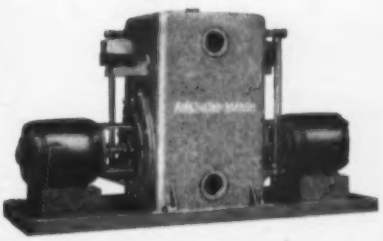
Just bolt unit down . . . connect return line and pump outlet and make electrical connections. *That's all!* You save time and money. Impellers are easily inspected by removing a few nuts . . . *you don't need to disconnect any piping!* Redi-Return Units eliminate suction troubles too—there's no piping between receiver and pump inlet. Impeller operates quietly, dependably, submerged in condensate even at temperatures to 210° F.

You can get American-Marsh Centrifugal Units with single or twin pumps . . . capacities from 1,000 to 100,000 square feet direct cast iron radiation . . . discharge pressures to 100 lbs. sq. in.

Easy-to-install, easy-to-inspect and trouble-free, they win real customer satisfaction. Call your American-Marsh Representative—he'll gladly review your problem without obligation.
Write for Redi-Return Bulletin 426.

AMERICAN-MARSH PUMPS
BATTLE CREEK MICHIGAN
In Canada:
American-Marsh Pumps (Canada) Ltd., Stratford, Ont.

Single-type Vertical Unit. Twin types also available. Choice of 1750 or 3500 RPM.



Redi-Return Twin Horizontal Unit—Single Units also available.

Darling it's so exciting . . .
I just can't wait
to see those sensational, new

STANDFORATED
Perimeter Baseboard Registers
WITH SLIDING DAMPER CONTROL

Write Now for Your Free Copy of Standard's Amazing New Pocket Catalog

- Used in homes, schools, churches and commercial installations.
- Comes in four foot sections.
- Simplifies balancing of heating systems.
- Fabricated of 20 gauge steel.
- Finished with Prime Coat only—special finishes on request.

Standard Stamping & Perforating Co.
3151 WEST 49th PLACE, CHICAGO 32, ILLINOIS

It's a lot easier to work with

RIDGID

Extra-Utility Pipe Vises

Compare those work-saver RIDGID Vises with any others and you see the bonus of extra utility you get for your money. Kit vise is easily toted to the job, quickly clamped on edge of bench or plank, ready for use. All other RIDGID vises have handy integral pipe benders and rests to make cutting and threading easier. Full-width firm-gripping jaws of top quality tool-steel, bodies of rugged special malleable—for years of service. 9 models, yoke and chain, 23 sizes, meet every need. Get your money's worth—buy RIDGID Vises at your Supply House.

THE RIDGE TOOL COMPANY • ELYRIA, OHIO

RIDGID
Work-Saver Pipe Tools

H. K. PORTER CO., INC. He is in complete charge of all manufacturing and sales operations. Mr. Diss was formerly vice president in charge of manufacturing.

LAWRENCE H. FLORA, formerly chief engineer, has been named director of engineering for *TINNERMAN PRODUCTS, INC.* in Cleveland. Mr. Flora's new position has been created as part of a program to expand new product development facilities.

HAJOCA CORP., one of the country's largest distributors of heating, plumbing, industrial and refrigeration supplies, has appointed *FRANK W. WHITE* advertising manager. Mr. White will help coordinate advertising and sales promotion efforts in 33 branches between Newark and Tampa. Headquarters will be in the general offices in Philadelphia.

JACK O. COFFEY has been named Aircraft Sales Manager of the South Wind Div. of *STEWART-WARNER CORP.*, Indianapolis.

HENRY B. FRY has been appointed manager of the *ATOMIC ENERGY COMMISSION's* New York operations Office to succeed *W. E. KELLEY.* Mr. Fry, deputy manager of the New York office since 1950 assumed his new duties on March 1. Mr. Kelley is retiring from government service.

IN THE TERRITORIES . . .

For *QUIET HEET MFG. CORP.* — Four new distributors. They are *GENERAL ELECTRIC SUPPLY CO.*, New York, *GENERAL ELECTRIC SUPPLY CO.* of New Jersey, *GENERAL ELECTRIC SUPPLY CO.* of Philadelphia, and *MELCHIOR, ARMSTRONG & DESSAU* of Ridgefield, N. J.

For *UNITED STATES AIR CONDITIONING CORP. — CLARK DISTRIBUTING CO.* of Charlotte, has been appointed distributor of its window type room unit air conditioners and upright store-type conditioners, in North and South Carolina. *SOUTHWEST WHOLESALE DISTRIBUTORS,* San Antonio, has been appointed as distributor for 62 counties in southwest Texas.

For *SERVEL, INC. — C. A. STOCKHOFF* is southwestern public utility manager, with headquarters in the firm's southwestern regional office at Dallas.

For the *POWERS REGULATOR CO.* — New address for Houston factory branch. The office is located at 3219 Milam St., Houston 6, Texas.

For *TOOLE & CUNNINGHAM* — Two new branch offices. One is located at 741 N. E. 11th St., Oklahoma City, Okla., with *F. E. MERRYMAN,* manager. The

FLEXIFLO

ADJUSTABLE AIR DIFFUSERS

ADJUSTABLE AIR PATTERN	VOLUME CONTROL	DRAFTLESS DIFFUSION

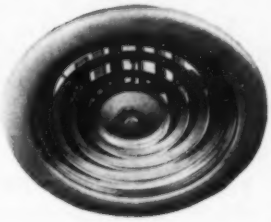
FLEXIFLO
FOR COOLING

Air travels in a constant pattern parallel to the ceiling regardless of any adjustment in air volume.

Type R

FLEXIFLO
FOR COOLING AND HEATING

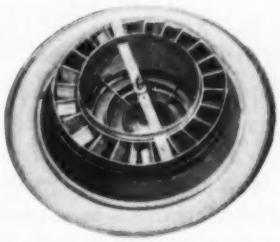
Air diffusion pattern and volume are easily adjustable, after installation, for any conditions, supplying air at any angle.



Type V

FLEXIFLO
SUPPLY AND RETURN

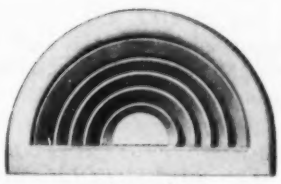
A combination supply and return outlet made with either the Type R or V blades. Fully adjustable.



Type CH

FLEXIFLO
FOR SIDEWALL AND CEILING

Provided with either Type R or V blades to blow air in desired pattern for cooling or heating.



Type S

Get the latest Flexiflo technical data on the complete line of better designed, low cost diffusers that meet any required operating conditions.

FLEXIFLO **Universal Diffuser Corp.**
892 Whittier St. • New York 59, N. Y.

View of service department at Ray Heat & Power Company, Chicago, Illinois.

available through RAY DEALERS everywhere

complete Factory-Certified parts and SERVICE for EVERY RAY BURNER

IN YOUR OWN AREA, wherever you are, your local Ray Dealer is staffed and equipped to:

- √ Supply full engineering data on the *right* Ray Burner for every job, whether it calls for an Oil, Gas or Gas and Oil combination.
- √ Install each Ray Burner according to specifications.
- √ Maintain each Ray Burner at top operating efficiency.

Each Ray Dealer forms a link in the far-flung network that has been forged to assure maximum satisfaction from every Ray Burner installation.

RAY DEALER ENGINEERING

Skilled engineering staffs like this one are available for Ray customers through Ray dealers everywhere.

RAY OIL BURNER CO.
Since 1922
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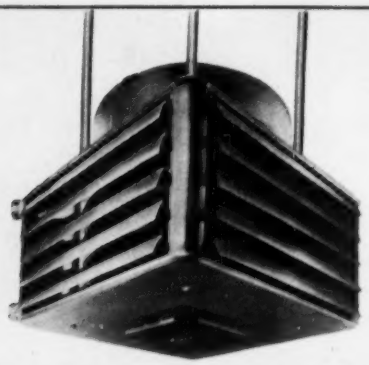
Atlantic Seaboard Div. • 629 Grove St., Jersey City 2, N. J.

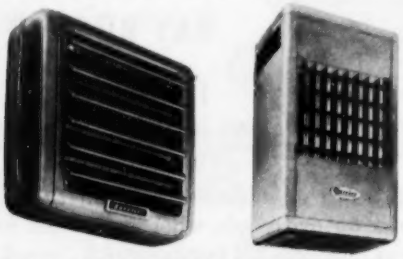


QUICK HEAT

for higher-ceiling spaces

***IN ANY DIRECTION*—1, 2, 3 or 4 sides**
***AT ANY ANGLE*—up or down**
***IN ANY VOLUME*—much or little**

CARRIER Four-way Directed-flo Space Heaters embody many reasons for being regarded as the most efficient and economical units of their type. *Flexibility* is one: independently controlled fan-propelled air streams from four easily adjustable outlets permit varying direction, distance and velocity of warmed air distribution. *Greater heating coverage, any-height installation, lower first cost, lower operating costs and lower maintenance costs* are others. Good styling. Steam or hot water. 82,000 to 500,000 Btu's.



CARRIER Propeller-fan Horizontal Type Unit Heater (*left*). Designed for good looks, high efficiency, and a wide variety of applications for delivering warmed air from heights of 15 to 18 feet. Single-row Aerofin heating coil minimizes air resistance and makes cleaning easy. Steam or hot water, in 10 sizes, 21,000 to 200,000 Btu's.

CARRIER Gas-fired Unit Heater (*right*) has one-piece heat exchanger and combustion chamber of high-heat-resisting Aluminized Steel. AGA-approved for all gases. In 7 sizes, 70,000 to 230,000 Btu's. Propeller-fan type (illustrated) or duct type.

CARRIER Blower-fan Type Heat Diffusers assure economical and efficient heating and ventilating in practically all kinds of industrial and commercial buildings. Sectionalized for easy on-the-job conversions into a variety of arrangements. In 6 sizes to 2,390,000 Btu's. Air handling to 31,000 cfm. Available for steam or hot water.

For further information on any of above products, write to Carrier Corporation, Syracuse, New York.

Carrier

AIR CONDITIONING • REFRIGERATION • INDUSTRIAL HEATING

other is located at 722 Orleans St., New Orleans, La., with *WESLEY VON WOGLOM* in charge.

For Architectural Products Division, *BURGESS-MANNING CO.* — Three new representatives. *JOHNSON & SCOTT*, Memphis, Tenn. has been named sales representative of sections of Arkansas, Mississippi, and Tennessee. *PALMER & LAWRENCE*, Birmingham, has been appointed sales representative in Alabama and part of Florida. *JOHN F. TEMPLETON CO.*, Atlanta, will handle sales in North and South Carolina, Georgia and the eastern part of Tennessee.

For *CARRIER CORP.* — The *O'DONNELL HEATING AND AIR CONDITIONING CO.*, Syracuse, was appointed as its distributor for the central part of New York state. *FRANK B. CLARK* is manager of the new agency.

For *EUTECTIC WELDING ALLOYS CORP.*, — Three new divisional branch offices: Midwest office is located at 166 W. Washington St., Chicago, *ROBERT H. GROMAN* in charge; southern office is in the Brown-Marx Bldg., Birmingham with *CHARLES BROWN* in charge; central office is located at 50 E. Broad St., Columbus with *L. D. RICHARDSON* in charge.

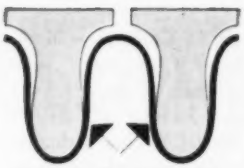
For *JACKSON & CHURCH CO.*, — *THOMAS L. CONLON* is the new representative for the Detroit area.

For *REYNOLDS METALS CO.*, — *MAPES AND SPROWL, INC.* has been appointed as a distributor of the firm's aluminum mill products. The new distributor is located at 300 Burnet Ave., Union, N. J.

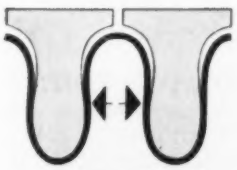
For *EGGLEHOF ENGINEERS* — *HARPER M. YOUNG, JR.*, has been appointed sales engineer in charge of the sales office in Little Rock, Ark.

For *SCAIFE CO.* — *JOHN McGOWAN* has been appointed to the sales staff of its New York City office. Mr. McGowan will assist the firm's New York district manager, G. J. Asbee.

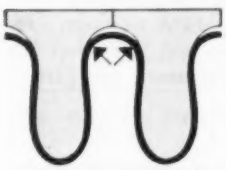
For *BARBER-COLMAN CO.* — New branch office addresses and men in charge of these offices are: *WILLIAM KARSLO*, 338 E. 25th St., Baltimore 18, Md.; *E. W. HEFFERNAN*, 435 Newtonville Ave., Newtonville 60, Mass.; *H. F. DAHLKE*, 2561 N. Clark St., Chicago 14; *G. H. HATFIELD*, 1951 Richmond Ave., Houston 6; *HERB PROSKE*, 66 Hudson St., Hoboken, N. J.; *J. W. HANCOCK*, 1433 W. Erie Ave., Philadelphia 40; *VIC LATHERS*, 1300 Rock St., Rockford, Ill.; *H. C. REIMERS*, 3714 14th Ave., Rock Island, Ill.; *KEN COATES*, 1011 Ridgely Bldg., Springfield, Ill.; *GEORGE KNOWLER*, 6693 Park Ave., Montreal 15, P. Q., Canada.



STARTING POSITION
(Line Cold)



MIDDLE POSTION
(Line Heating Up)



FINAL POSITION
(Full Temperature)

directed **flexing** is the better buy!

Granted this is a rather abrupt and sure statement, yet we believe you will agree with it once you fully understand what Directed Flexing is and how it smooths out joint action, produces the ideal flexing movement, protects against over concentrated stresses . . . all of which make for long joint life.

Two design features are linked with the Directed Flexing feature. In fact, they are responsible for it.

1 the all-curve corrugation

2 the matching shape of the equalizing rings

Note how the corrugation when flexing under the force of the line movement uses the side surfaces of the adjacent rings as a guide. Instead of moving more or less as a flat plane, as would a straight sided corrugation, it actually wraps itself around the ring, contacting it progressively from bottom to near the top, reversing itself when the line cools off. This action not only distributes flexing stresses. It smooths out the movement. The equalizing rings, essential to this action, serve in another important way. They progressively control and limit the traverse on all corrugations.

This, in a nut shell, is the engineering back of the Badger Directed Flexing feature. If you will give a moment's thought to the stresses set up in a joint by a pipe line movement, you, too, will give full weight to the value of the Directed Flexing design of these expansion joints. You, like countless others, will see that Badger Expansion Joints will go onto your lines.

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Original and Sole Manufacturer of Badger Expansion Joints
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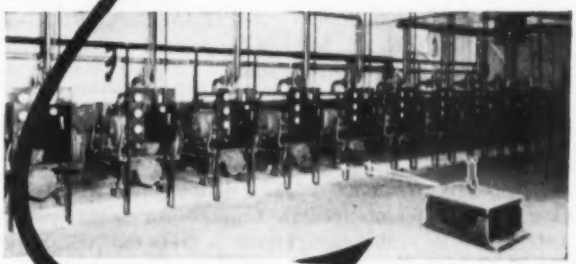
STOP VIBRATION



with **KORFUND VIBRATION CONTROL**

Problem: When erecting a new office building, a prominent refrigeration equipment manufacturer wanted to install 41 of his units in two penthouses. Light-weight flooring with 40 foot spans between columns was planned. Vibration and noise transmission had to be prevented.

Solution: Korfund steel spring Isolators and Elasto-Rib pads completely prevented vibration and noise transmission, eliminated all bolting to the floor, and made economical light-weight floor construction possible.

In Air Conditioning, Korfund Vibration Control has paid off in dollars and cents for thousands of Engineers and Contractors, because Korfund units reduce transmitted vibration and:

- Permit installation *anywhere* in apartment, public, and industrial buildings
- Decrease original building and foundation costs
- Permit installation without reinforcing floors
- Lengthen machine life
- Permit higher operating speeds
- Reduce maintenance costs
- Insure quieter operation

We'll gladly send more information on Korfund Vibration Control for compressors, fans, pumps, boilers, air conditioners and other equipment, write today for your free copy of Bulletin #2, or see our catalog in Sweet's Files.

For specific recommendations, contact us or your local Korfund office. A half century of experience is at your disposal.

THE KORFUND CO., INC.

KORFUND VIBRATION CONTROL — SPRINGS — RUBBER — CORK

48-01F Thirty Second Place, Long Island City 1, N. Y.
In Canada: 510 Canal Bank, Ville St. Pierre, Montreal

For *RADIATOR SPECIALTY CO. — GEORGE W. DYER* is now Chicago district representative of the firm's "Solder Seal" products.

For *AIR REDUCTION SALES CO. — D. E. DALLMAN* has been appointed manager of the Minneapolis district. Mr. Dallman, an employee of the company for 18 years, replaces the late M. M. Weist.

For *ROBERTS-GORDON APPLIANCE CORP. — DEAN WAGONER, JR.* has been appointed as North and South Carolina sales representative.

For *BUFFALO FORGE CO.* and *BUFFALO PUMPS, INC.* — New Chicago sales representatives *TRUMBO, JOHNSON & HECKEL.* Mr. Trumbo and Mr. Heckel have been representatives in Chicago for many years. *S. O. JOHNSON*, the new partner, is from the New York and Cincinnati districts. The Chicago office is located at 20 N. Wacker Drive, Chicago 6.

For the *NATIONAL RADIATOR CO. — WILLIAM S. HENDRICKS* has been appointed heating sales engineer in the Chicago branch office at 400 W. Madison St. Mr. Hendricks recently completed a basic heating and engineering course conducted by the firm.

For *OWENS-CORNING FIBERGLAS CORP.* — Members of the 1953 President's Sales Club have been announced: *A. C. WILSON*, chairman, Tampa; *WILLIAM W. ALLEN, JR.*, St Louis; *JAMES D. BETTRIDGE*, Toledo; *WALTER W. A. BODEN*, New Orleans; *EARL V. DRAGICS*, Houston; *JOHN A. McKAY*, New York; *OWEN MORRIS*, Richmond; *JAMES L. NEAL*, Dallas; *E. N. STILL*, Seattle; and *JOHN A. TALLMAN, JR.*, Portland. This group includes the firm's 10 leading branch sales managers in the nation.

For *B-I-F INDUSTRIES — HERMAN E. TROTTER* has been appointed as Buffalo, N. Y. representative. He will handle sales of *BUILDERS-PROVIDENCE, INC.*, flow meters and controllers and *OMEGA MACHINE CO.* chemical feeders. The office is located at 3053 Main Street.

For *LAMSON CORP. — LOU DOELLING* has been promoted from district engineer to field engineer. He will be located at the Atlanta office and will cover the territory of Alabama, Mississippi, Tennessee, and part of Georgia.

For the *MERCOID CORP. — RICHARD O. MARTINSEN* is a member of the sales staff of its Philadelphia branch office and warehouse.

ELECTRO
Extra
DYNAMIC
ependable industrial motors

E.D. motors are engineered for *silent* operation with special slot design, dynamic balancing and scientific bearing assembly.

FOR QUIETER OPERATION . . . Over half a century of building motors for "the silent service" to power and air-condition U. S. submarines has given Electro Dynamic an unequalled experience in producing motors for installations where SILENCE is a primary consideration.

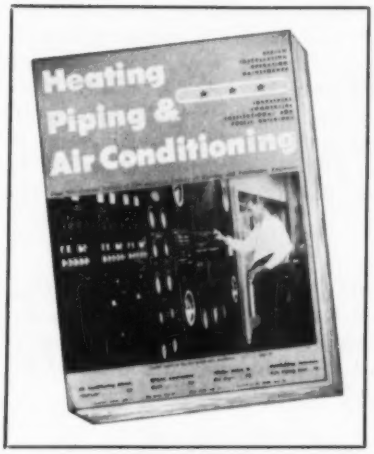
WRITE TODAY FOR CATALOGUE NO. 581.

ELECTRO DYNAMIC
DIVISION OF GENERAL DYNAMICS CORPORATION
BAYONNE, NEW JERSEY

KEENEY IS HEADQUARTERS

FOR PRACTICAL DATA TO HELP SOLVE YOUR PROBLEMS IN

HEATING, PIPING & AIR CONDITIONING



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A collection of outstanding papers and data on industrial piping selected from eight years' issues of "Heating, Piping and Air Conditioning." Very comprehensive and practical. Reveals how various difficult piping problems that arose in different industrial plants were successfully worked out by piping experts. Design, installation, operation, and maintenance . . . steam, air, gas, oil, process, water and refrigeration piping . . . piping in food, chemical and textile industries—in refineries, paint, plastic, paper and steel mills—in railroads, utilities, etc.
196 pages, $1.50

• INDUSTRIAL AIR CONDITIONING HANDBOOK

Information on the purpose, cost, design, operation and maintenance of both process and comfort air conditioning systems in manufacturing plants of many kinds. The combined knowledge and experiences of 33 prominent engineers, every one a designer or in direct charge of the largest factory air conditioning systems in operation. This shows other engineers how air conditioning helps speed production, improve products, and increase worker efficiency . . . how to operate systems economically.
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• SNOW MELTING MANUAL

Complete information on correct design, installation and operation of snow melting systems is offered in this reprint of articles originally published in "Heating, Piping and Air Conditioning." Design data based on a study of—and others' actual experience with—over 100 snow melting systems of all kinds. Applications illustrated, for loading platforms and docks; sidewalks; roads; driveways; marquees; parking areas; runways; railway switches, etc., prove that this method costs no more than other methods.
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A practical manual on fume removal, dust collecting, ventilating and exhaust systems for industrial plants. Tells how to design correctly and provide for various ventilation requirements . . . make measurements and analyses of fumes, mists and dusts . . . plan exhaust systems, etc. Twenty eminent authorities contributed also to detailed descriptions of systems in actual operation in many plants, whatever the manufacturing process.
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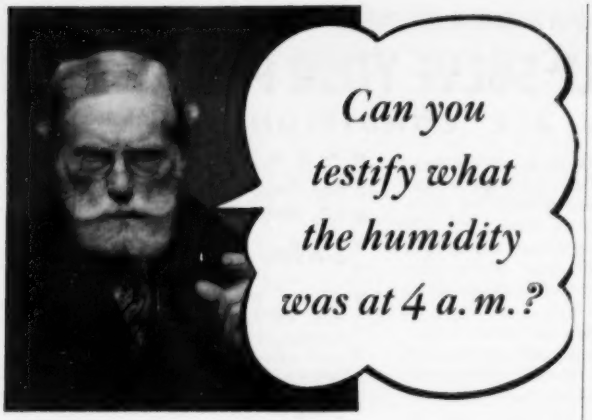
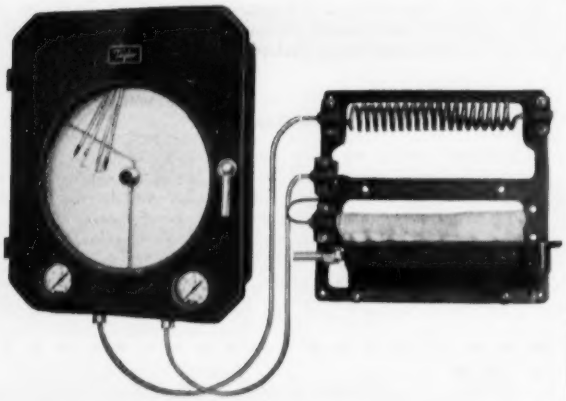


THERE are times when an accurate record of the humidity can save a lot of time and money—and headaches too. Taylor makes a full line of recording, recording-controlling and indicating instruments for every air conditioning need. We'll be glad to work with you or your consulting engineers or contractors to give you the instruments best suited to your individual problem. Ask your Taylor Field Engineer, or write Taylor Instrument Companies, Rochester, N. Y., and Toronto, Canada.



RECORDING OR RECORDING-CONTROLLING HYGROMETER with bottle or continuous water feed. Model shown is recommended where panel can be advantageously located within apparatus room or duct for best circulation across the bulbs. Motor-driven-fan models may be installed inside or outside of room! Available with bottle-feed or continuous water supply.

TAYLOR 10BG HYGROMETER. With bottle-fed reservoir; or continuous feed, as specified. Combines accuracy of an etched stem thermometer with ruggedness of an industrial thermometer. Easier-to-read. Perfect for accurate spot checks on jobs like **air conditioning supply and return ducts, dryers, and other closed compartments.**

Instruments for indicating, recording and controlling temperature, pressure, flow, liquid level, speed, density, load and humidity.

TAYLOR INSTRUMENTS MEAN ACCURACY FIRST

For the *MARSH HEATING EQUIPMENT CO.* — *BRUCE L. EVANS CO.*, 4030 Chouteau St., St. Louis 10, Mo., is the new representative in the St. Louis territory.

For *GENERAL ELECTRIC'S TRUMBULL ELECTRIC DEPT.* — Three changes in its field sales organization. *J. E. KERBY*, formerly manager of the Southwest district, is manager of the newly created West Central district, with headquarters in Kansas City. *A. P. McGRAW*, who has been a sales representative in the South Carolina area, is now manager of the Southwest district, with offices in Houston. *J. E. VAN EFFEN* is manager of the newly established Cleveland district, with headquarters in Columbus.

For *MERCER TUBE & MFG. CO.* and the *SAWHILL MFG. CO.* — *J. E. McFATE* has been appointed as district sales manager for its Michigan territory. District offices are located in the Buhl Building, 535 Griswold St., Detroit.

For *WORTHINGTON CORP.* — An exclusive wholesale distributor to merchandise its three, five, 7½, 10, and 15 ton package commercial and residential air conditioners. *WARREN-CONNOLLY CO., INC.*, New York, will serve the five boroughs of New York, Long Island and Westchester.

For *VILTER MFG. CO.* — *IRVING WEINBERG* has been appointed as district manager of the Atlanta, Ga., branch office.

For *GENERAL CONTROLS CO.* — *LEONARD SCHNALL* has been appointed to head a new field sales and service office in Syracuse, N. Y. The new Syracuse office will report to the Buffalo branch office of General Controls, but will handle all sales and service matters on household and industrial controls in a large area around Syracuse.

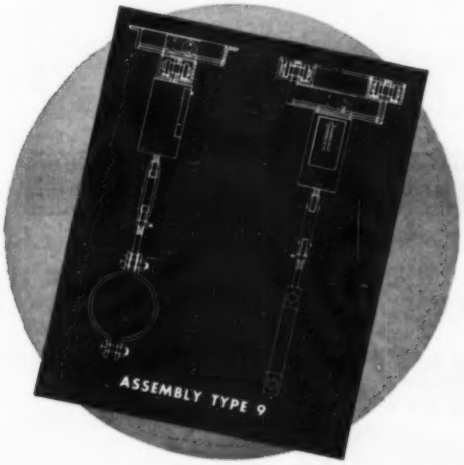
For *DELAVAN MFG. CO.* — *LEE N. BEARDSLEY* of Chicago has been named as factory sales engineer. Mr. Beardsley will cover Wisconsin, northern Illinois, Indiana, and western Michigan. He was formerly associated with the field control division of H. D. Conkey Co. as sales engineer. *PETER PULEO* has been appointed as sales representative in eastern Missouri, southern Illinois, southwest Indiana and western Kentucky. Mr. Puleo was previously with Industrial Process Equipment Co. of St. Louis.

For *ORR & SEMBOWER, INC.* — The relocation of the midwestern district office from Cleveland to 4809 N. Claremont Ave., Chicago. *R. C. CURRIE* is district *H. C. SHARP CO.*, St. Louis, Mo., for the major part of

For *TRION, INC.* — New sales representative is the manager.

All Movements Under Control with a

BLAW-KNOX OVERHEAD ROLLER ASSEMBLY



Type 9 Functional Assembly (illustrated) provides free rolling action in two directions and freedom of movement in vertical position. Its *internal swivel* action gives full control over all movements, and minimizes absorption of piping thrusts by the connecting flanges . . . a big help in keeping maintenance and replacement costs at rock bottom. Available for all standard size piping. Accommodates operating loads up to 12,000 lbs.

Catalog No. 53 on request.

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POWER PIPING AND SPRINKLER DIVISION
PITTSBURGH 33, PA.

BLAW-KNOX

GET MORE OUT OF YOUR SPRAYING EQUIPMENT WITH LESS POWER

For spraying, washing, rinsing, cooling and air conditioning, Yarway Spray Nozzles will improve the efficiency of your spray equipment.

There are no internal vanes or other restrictions to clog or hinder the flow.

Yarway Spray Nozzles are available in two types—the Yarway Involute producing fine hollow cone spray with minimum energy loss, and the Yarway Fan-spray for flat fan-shaped spray with time-saving slicing action for cleaning.

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YARNALL-WARING COMPANY

107 Mermaid Ave., Philadelphia 18, Pa.

YARWAY / spray nozzles

Missouri and southern Illinois. *HARRY A. KING* has been appointed eastern regional sales manager for the firm.

For the Janitrol Domestic-Commercial Div. of *SURFACE COMBUSTION CORP.* — *WILLIAM K. DRAKE* is "Janitrol" sales engineer in the Buffalo territory. Mr. Drake's office will be located at 209 Morgan Bldg., Buffalo, N. Y.

For *IRON FIREMAN MFG. CO.* — *B. B. MAGEE* has been transferred to its Minneapolis office, as western sales manager and will be administrative head for the company's northwest and Pacific coast regions. Other additions to the firm are three new district sales managers for the northwest region: *ARTHUR KUHN*, Dubuque, Iowa; *FLETCHER POOLE*, Sioux Falls, S. Dak.; and *ROBERT S. BEAN*, Minneapolis.

For the *WESTINGHOUSE ELECTRIC CORP.* — Six new franchises awarded. Those who will sell self-contained and field-assembled air conditioning are: *STAFFORD-SMITH INC.*, Kalamazoo, Mich., *LEHIGH AIR CONDITIONING CO.*, Allentown, Pa., *CENTRAL ENGINEERING CO.*, Waco, Texas. Those franchised to sell the electronic air cleaner, "Precipitron", are *KRIECHBAUM AND DEWEIN*, Burlington, Iowa, *ALTON PLUMBING AND HEATING CORP.*, Mineola, N. Y., *ALHART ELECTRIC CO., INC.*, Rochester, N. Y.

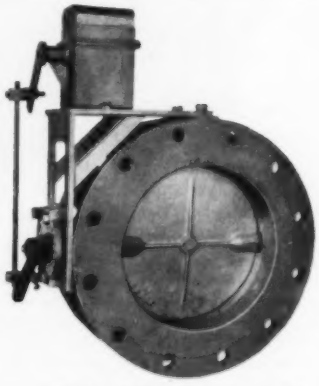
Westinghouse has also announced that the Air Conditioning Div. has opened branch application engineering offices in Buffalo, N.Y., and Cincinnati, Ohio. *T. J. FEELEY* has been appointed manager of the Buffalo office serving northwestern New York and northern Pennsylvania. *J. M. LITTLE* was named manager of the Cincinnati office serving southern Ohio, central and western Kentucky and southern Indiana. *JAMES O. CLEVENGER* has been named sales manager of general industrial products of the corporation. He will be located in the Pittsburgh office.

For *PHILIP CAREY MFG. CO.* — *TAYLOR-SEIDENBACH, INC.*, with offices in New Orleans and Shreveport, La., has been appointed as distributor and contractor for the firm's asbestos and magnesia insulation products.

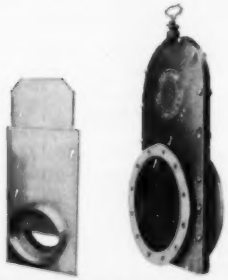
For *TRANE CO.* — Placement of representatives who have just completed the post graduate engineering course held in La Crosse, Wis. Representatives and their locations, are: *BRUCE ADAMS*, Portland; *ANTHONY C. DEL VECCHIO*, Philadelphia; *ROY DOWNHAM*, Davenport; *JACQUES F. DREYFUSS*, Syracuse; *VERNON T. FRANKWICH*, Baltimore; *RAYMOND O. GOODMAN*, Knoxville; *ORLIN C. HOCKIN*, Toledo; *TED KOZERSKI*, Detroit; *ROBERT L. MOORE*, Cincinnati; *ANDREW K. MORRIS*, Wilkes-Barre, Pa.; *JOSEPH D. ORLANDO*, New York; *JAMES A. POHLMAN*, Indianapolis; *ALFRED R. SCARPERI*, Washington, D. C.; *ALLEN SKILEE*, Houston; *FRANK L. VAUGHN*, Birmingham; *WILFRED R. BARNARD*, La Crosse; *SCOTT STAHR*, La Crosse; *KENNETH MacDONALD*, Johannesburg, South Africa; *W. E. HAINLINE*, Des Moines.

for
AIR CONDITIONING
HEATING SYSTEMS
DUST COLLECTING
VENTILATING SYSTEMS
WATER PIPING
DRAINING & FILLING

Better Install
W. S.
ROCKWELL
Butterfly or Slide
VALVES
for Air · Gas
Liquids · Solids

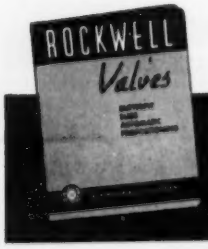


★ Minimum pressure drop—when fully open, valve practically as free as pipe itself.
★ Uniform, quick control manually or automatically.
★ Positive shutoff—commercial, drip tight or air tight.
★ Pressures—slide valves to 100 p.s.i.; butterfly valves to 600 p.s.i. Temperature range—from below zero to 2000° F.
★ Made of any metal or rubber lined.
★ Sizes—1" to 72" and larger.



Rockwell butterfly valve with electric motor operator; may be equipped with air diaphragm, air or hydraulic cylinder, solenoid, float or other automatic operator, or with lever, handwheel or chainwheel control.

Rockwell slide valve with pull handle control; available also with lever handwheel, chainwheel or air cylinder control. At left—a simple slide valve of sheet steel or aluminum.



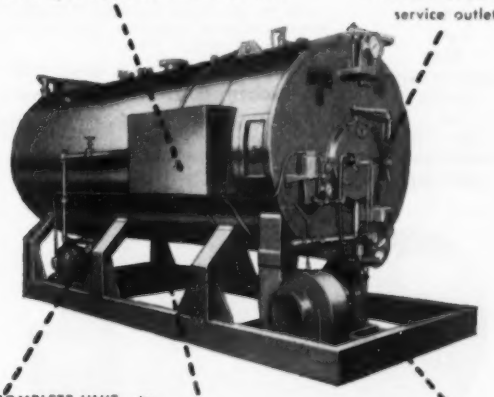
Write for this Catalog

W. S. ROCKWELL COMPANY
2542 ELIOT STREET • FAIRFIELD, CONN.

Here's Why... AMESTEAM GENERATOR Cuts Your STEAM COSTS

EYE-LEVEL CONTROLS and full automatic operation save time and labor.

FULLY PIPED AND WIRED — needs only to be connected to service outlets.



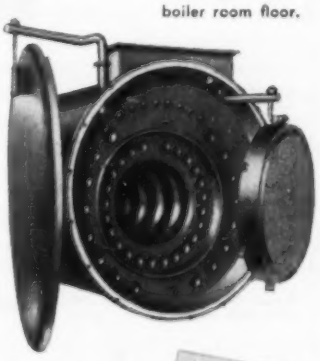
COMPLETE UNIT with feed water pump, fan, condensate tank, refractories, insulation. Needs no expensive stack or brickwork!

EVERYTHING EASY TO GET AT! Look at the space underneath the shell!

REQUIRES NO SPECIAL FOUNDATION! Just set unit on boiler room floor.

HERE'S EASY CLEANING!

Rear flue cover and one-piece rear baffle are easily opened on davit-type hinges to expose furnace and all tubes — and there are ample clean-out doors in front end.



IF YOU WANT LOWER STEAM COSTS look into these compact units of 80% guaranteed efficiency. Write now for Bulletin 1050. 20 sizes, 10 to 600 h.p., 15 to 200#, to burn oil or gas. **WRITE TODAY!**

AMES IRON WORKS INC.

BOX D-53 OSWEGO, N. Y.

Builders of Better Boilers since 1848

STEEL TO STEEL KEEPS FINS TIGHT

Maximum efficiency in finned radiation requires perfect, continuous contact between fins and pipe at all times for only when this contact is perfect will there be maximum heat transfer from pipe to fins and from fins to room air.

AUTORAD uses steel for *both* tube and fins and since the coefficient of expansion of fins and tubing is the same, no amount of expansion or contraction can lessen the bond between them and decrease heat transfer. And no electrolytic action can destroy the perfect bond.

AUTORAD has developed a method of bonding fins to tubing so that the resulting contact is as firm and perfect as a welded joint. As a consequence heat transfer is kept at peak efficiency.

To you as a contractor this means long years of customer satisfaction and customer satisfaction means greater profits to you.

Ask for complete data and prices.

AUTO-RAD Inc.

3535 Fillmore Street, Chicago 24, Illinois

COLE

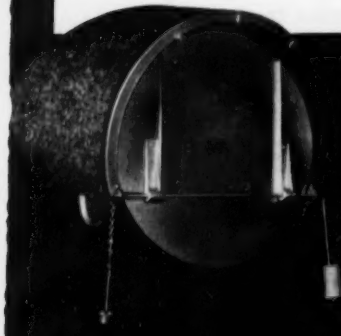
INDUSTRIAL

DRAFT CONTROLS

FOR EVERY NEED — ANY SIZE — ANY SHAPE

Outperform and outlast

ORDINARY CONTROLS



COLE

STANDARD ROUND GATE CONTROL

with or without universal sleeve. Open check type. Perfectly counterbalanced. Ball bearing equipped. Stock sizes from 14" to 36". Prices start at $10.83. For top or side mounting. Special sizes on order.

COLE

RECTANGULAR DAMPER CONTROL

Saves 10% to 30% on fuel. Internal damper type. Ball bearing equipped and counterbalanced in all positions. Large close fitting blades. All sizes and shapes, for any type breeching. Top or side mounting. Round stock sizes 14" to 36"

COLE-SEWELL ENGINEERING CO.

2288 UNIVERSITY AVENUE • ST. PAUL 14, MINNESOTA

They SELL! They PLEASE!

AURORA

CLOSE-COUPLED

Packaged

AIR CONDITIONING PUMPS

for **EVAPORATOR COOLING TOWERS** • **AIR CONDITIONING UNITS** • *also for* **GENERAL SERVICE**

These are outstanding pumps, high in favor with air conditioning contractors and manufacturers of air conditioning equipment. Mechanical seal requires no packing or maintenance. Disassembly without disturbing pipe connections or hold down bolts.

- LOW COST
- LONG LIVED
- SMOOTH, QUIET
- MECHANICAL SEAL
- DEPENDABLE
- DISASSEMBLY is QUICK, SIMPLE
- CARRIED IN STOCK

Capacities up to 150 G. P. M., Heads to 100 Ft.

Aurora Type JMC Pump — Close-Coupled

CASINGS vertically split. Casing wearing ring standard.

MECHANICAL SEAL—standard, located in packing cover.

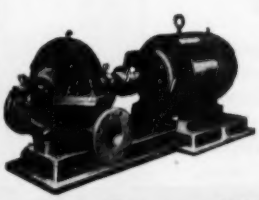
IMPELLER — balanced, enclosed type, high grade bronze.

MOTOR—NEMA specs., stainless steel shaft on JMC — for all circuits and various enclosures.

BALL BEARINGS — on JMC, built into motor.

OTHER AURORA AIR CONDITIONING UNITS

We are also in a position to supply various sizes of air conditioning pumps in V-Belt drive, and flexible coupling drive. Our large size type G.M.C. Close-Coupled Pumps can be furnished up to 800 G. P. M. and heads to 200 ft.



ALSO — AURORA SPLIT CASE CENTRIFUGAL PUMPS

— single and two stage for water supply, handling condenser circulating water, brine circulation, booster service and many other duties.

Complete Information on Request

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AURORA Always PUMPS

AURORA PUMP COMPANY

SUBSIDIARY OF THE NEW YORK AIR BRAKE COMPANY

80 Loucks Street — Aurora, Illinois

MEETINGS & CONVENTIONS

IBR SCHOOL OF MODERN HEATING — May 12-14, North Carolina State College, Frank Thompson Gymnasium, Raleigh; May 19-21, Atlanta, Ga.; May 25-27, Tampa, Fla.; June 2-4, Pittsburgh, Pa.; June 9-11, Binghamton, N. Y.; June 16-18, Burlington, Vt.; June 23-25, Boston; June 29-July 1, New Haven, Conn.; July 15-17, Fargo, N. D.; July 22-24, Great Falls, Mont.; July 29-31, Spokane, Wash.; August 4-6, Seattle, Wash.; August 11-13, Portland, Ore.; August 18-20, San Francisco; September 1-3, Denver; September 9-11, Lincoln, Neb.

This is the first time the school has been made available to students in the west since it was organized in 1950. Tuition for the IBR school currently is $23.00 but will be increased to $28.00 after July 1, 1953. Students wishing further information may obtain it from the Institute of Boiler and Radiator Manufacturers, 60 E. 42nd St., New York 17.

HEATING, PIPING AND AIR CONDITIONING CONTRACTORS NATIONAL ASSOCIATION — 64th annual convention, May 13-16, Edgewater Beach Hotel, Chicago. Secretary, Joseph C. Fitts, 1250 Avenue of the Americas, New York 20. Secretary of Labor Martin P. Durkin is the featured speaker. Joseph S. Kearny, president of the Northwestern Heating & Plumbing Co., 1905 Greenleaf St., Evanston, Ill., is chairman of the convention committee.

CONFERENCE ON INSTRUMENTATION IN WATER, SEWAGE AND INDUSTRIAL WASTE TREATMENT — May 14, Manhattan College, 242nd St. and Broadway, New York 71. The conference is being offered by the Civil Engineering Dept. of Manhattan College with the sponsorship of the New York City Board of Water Supply and the New York City Dept. of Public Works and with the cooperation of the Metropolitan Section of the Instrument Society of America. Objective of the conference is to offer information on application of instrumentation to water, sewage and industrial waste treatment processes. Measurement, recording and control of process variables in these fields will be the subjects of technical papers and panel discussions.

Further information may be obtained from Brother Joseph McCabe, head of the Civil Engineering Dept., Manhattan College.

AIR POLLUTION CONTROL ASSOCIATION, 4400 Fifth Ave., Mellon Institute Building, Pittsburgh — Annual meeting, May 25 to 28, Lord Baltimore, Baltimore.

CONFERENCE ON ELECTRIC HEATING, Detroit-Leland Hotel, Detroit, May 26-27 — Sponsored by the American Institute of Electrical Engineers' Committee on Electric Heating and the Michigan Section of the Institute in cooperation with the Industrial Engineers Society of Detroit. Twenty papers on electric furnaces, resistance and radiation heating, induction and dielectric heating and other aspects of heating by electricity will be presented.

Headquarters of the AIEE is at 33 W. 39th St., New

greater efficiency for

Commercial and Industrial

GAS

fired heating plants with

field

"M-G" draft controls

1. Double acting gate opens inward to regulate up-drafts and outward to relieve down-drafts.
2. Adding or taking off weights provide simple adjustment for up-draft conditions at time of installation.
3. Control will relieve internal or down-draft pressures of only a few thousandths of an inch.
4. Weights attached to gate itself are factory set to insure extreme sensitivity to down-draft conditions.
5. Corrosion resistant knife edge bearings resting on self-aligning bearing plates assure extreme sensitivity yet long life.
6. Side wings improve the regulation, making the control accurate at all gate positions.
7. Long collar keeps gate out of the path of flue gases—resulting in greatly increased life.

Now there is a Field Draft Control to provide for commercial gas-fired heating plants the same accurate, dependable, fuel-saving performance that has made Field first choice for oil and coal furnaces. The new Field "M-G" for gas is fully proven, widely accepted, fully safe — a control specially designed for gas but retaining all outstanding design features of the Field Type M Control. Write today for complete information.

FIELD CONTROL DIVISION

of H. D. Conkey & Company — Mendota, Illinois

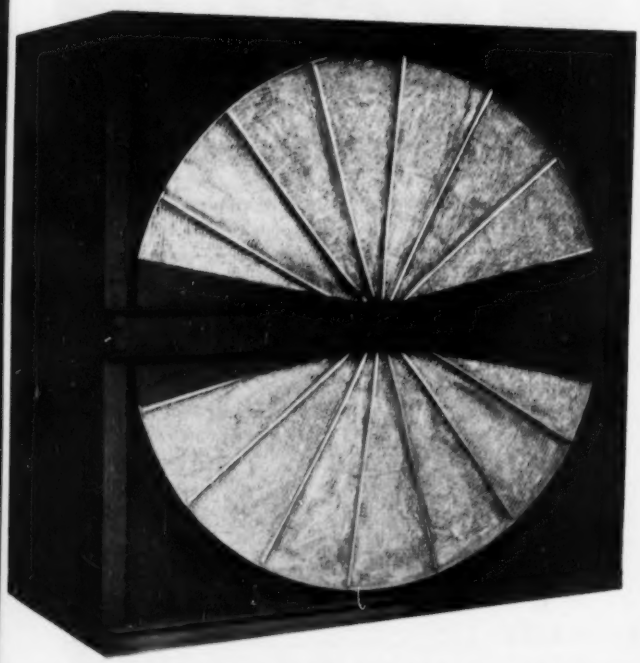
AFFILIATES: Conco Building Products, Inc. — Brick, Tile, Stone
Conco Materials Handling Division, — Cranes, Hoists

UP-DRAFT VIEW
Gate opens inward to regulate updrafts in conventional, proven manner, checking any excess in draft.
DOWN-DRAFT VIEW
Gate opens outward to relieve down drafts which might affect flame. An optional safety switch closes main gas valve in case of prolonged down draft, thus providing full protection.

THERM O WHEEL

Helps Solve

Ventilating Problems



ROTARY AIR HEAT EXCHANGER

Preheat (or precool) make-up air, at substantial savings

The rotating of metallic wool in counter-flowing air streams permits an almost complete transfer of temperatures between exhaust and fresh make-up air. Due to this recovery of temperatures, fuel and power consumption are substantially reduced.

In designing original installations, the incorporation of the Therm-O-Wheel permits the use of smaller and thus less costly heating and cooling equipment. May also be used to rectify conditions where existing equipment is insufficient to handle the problems in heating brought on by the ventilating system.

Write for complete details.

Some territories for distributors still open.

THERM-O-WHEEL, INC.

95 Liberty Street, New York 6, N. Y.

York 18. P. H. Goodell of Detroit is the chairman of the meeting.

ANNUAL WISCONSIN POWER CONFERENCE AND EXPOSITION — June 3-5, Schroeder Hotel, Milwaukee. Sessions will include educational papers and audience participation panel discussions. The exhibit will be sponsored by local representatives of manufacturers of power equipment and allied products. Secretary of the conference is Lester E. Hoppe, 2335 N. 58th St., Milwaukee 10.

NATIONAL ASSOCIATION OF BUILDING OWNERS AND MANAGERS OPERATING EXHIBITS, 134 N. LaSalle St., Chicago 3 — June 7-11, William Penn Hotel, Pittsburgh. Sponsored by the association's Operating Methods and Equipment Committee, the exhibit will have displays of all products and services needed to run modern commercial buildings.

NATIONAL DISTRICT HEATING ASSOCIATION, 827 N. Euclid Ave., Pittsburgh 6 — 44th annual meeting, June 9 to 12, Lookout Mountain Hotel, Chattanooga, Tenn.

FOURTH NATIONAL STORE MODERNIZATION, BUILDING AND MAINTENANCE SHOW, Madison Square Garden, New York, June 9-12 — Sponsored by the Store Modernization Institute, 20 E. 55th St., New York 22, it will cover physical properties and operation of retail stores including warehousing and distribution.

SEVENTH SHORT COURSE ON HOT WATER AND STEAM HEATING SYSTEMS, University of Illinois, Urbana, June 15-18 — Co-sponsored by the University of Illinois and the Institute of Boiler and Radiator Manufacturers. This course will be similar to previous courses in that it will consist of a combination of classroom work and lectures as a means of presenting the latest material on hot water and steam heating systems.

AMERICAN WELDING SOCIETY, 33 W. 39th St., New York 18. — National Spring Technical Meeting, June 16 to 19, 1953, Shamrock Hotel, Houston, includes a four-day Welding and Allied Industry Exposition in the Shamrock Hall of Exhibits. The exhibits will be presented by manufacturers who sell products for welded fabrication, weldments, welding processing, gas cutting, brazing, finishing, tooling, gaging, testing, stress relieving, X-raying, servicing and handling.

THE NATIONAL HEATING WHOLESALERS ASSOCIATION, 27 E. Monroe St., Chicago 3 — Spring convention, June 22-24, Grove Park Inn, Asheville, N.C.

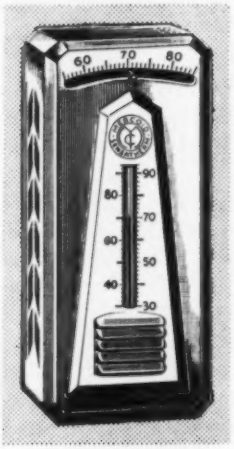
AMERICAN SOCIETY FOR ENGINEERING EDUCATION—61st annual meeting, June 22-26, University of Florida, Gainesville. Plans call for more than 100 conferences including a series on atomic energy engineering; lectures on digital computers and discussions by industrial economists. General chairman is Prof. John C. Reed, head of mechanical engineering at the University of Flori-

MERCOID THERMOSTATS

EQUIPPED WITH MERCOID SEALED MERCURY SWITCHES

for

HEATING
AIR CONDITIONING
REFRIGERATION



LOW VOLTAGE TYPES MERCOID SENSATHERMS

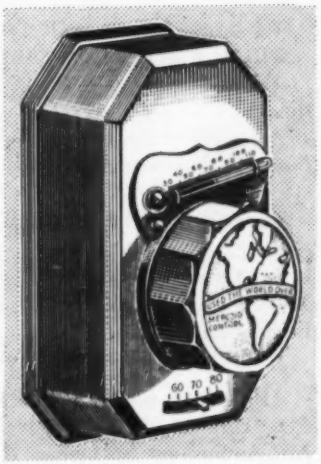
For close and accurate temperature control. The Mercoid Sensatherm is extremely sensitive—it detects changes in temperature as quickly as they occur, thereby maintaining the desired temperature level at all times. The Sensatherm operates direct from the true room temperature without the use of internal heaters—no cycle adjustments—no differential settings—no settings for long or short operations—simply install it—set it and forget it.

Type H for Heating—circuit opens on temperature rise.

Type R for Air Conditioning or Refrigeration—circuit closes on temperature rise.

Type HR (Dual Type) one circuit opens and one circuit closes on temperature rise. Operating Differential all types, ½°F. plus or minus, (total differential 1°F.). Available ranges: 30-60°F, 35-65°F, 40-70°F, 50-80°F, 55-85°F, 60-90°F, 65-95°F. Electrical Capacity: 9/10 Amp. at 24 volts or less.

LINE VOLTAGE TYPES SERIES No. 855



For automatic room temperature control where it is desired to handle the full motor load connected directly to the line voltage without the use of a relay.

No. 855—For heating—circuit opens on temperature rise.

No. 855R—For Air Conditioning and Refrigeration—circuit closes on temperature rise.

Operating differential approximately 2°F. All types available with manual switch for "Fully on", "Fully off" or "Fully automatic" operation.

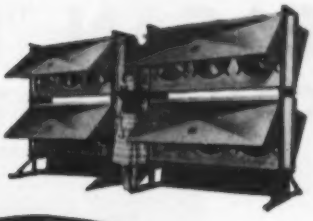
Available ranges: 30-60°F, 35-65°F, 40-70°F, 50-80°F, 55-85°F, 60-90°F, 65-95°F. Electrical Capacity—A.C. or D.C. 10 Amp. 115V. or 5 Amp. 230V. Motor Rating—115V. A.C.—RI 1 hp., SP ½ hp., D.C. ½ hp., For 230V. RI 1½ hp. SP ½ hp. D.C. ½ hp.

Write for catalog No. 700A.

THE MERCOID CORPORATION
4201 BELMONT AVE., CHICAGO 41, ILLINOIS, U.S.A.
New York: 205 E. 42nd St. Philadelphia: 3127 N. Broad St.

20 TON

40 TON



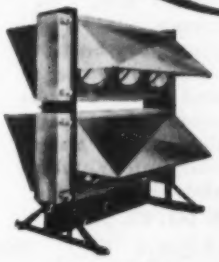
Cut out all **WATER** *problems*

WITH THE

UNICON*

by KRAMER

The UNICON eliminates all water problems . . . because it does not require any water. Any size compressor, regardless of tonnage, can be air-cooled with the UNICON by KRAMER. Stands, hood, and wind deflectors are available for simplified outside mounting of this Remote-Type Air-Cooled Condenser.



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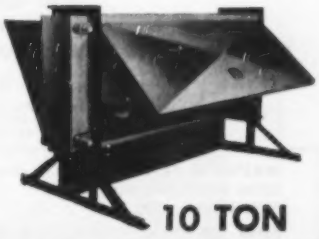
SPECIAL APPLICATIONS
Write to us about your condensing problem.



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BULLETIN U-177-S
*PATENT-PENDING

KRAMER TRENTON CO.
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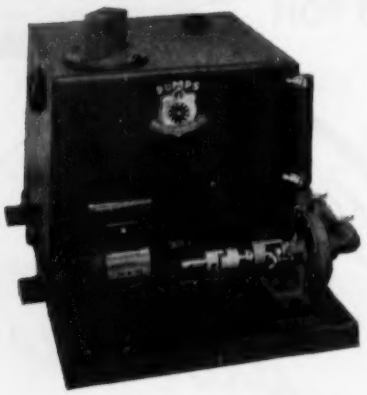
ANNOUNCING—

The New Improved Design

EAGAN "EAGLE"

CONDENSATE PUMP



MATCH THIS FOR VALUE!

Here's the best condensate pump "buy" on today's market. It provides far more capacity than any similar pump . . . 8,000 sq. ft. EDR at 20 PSI . . . and it's only $124.00 (trade price, F.O.B. Phila.)

REDUCED PRICE

Compare These Six Features

IMPROVED DESIGN

- Low inlet, 2" I.P.S., 12" from floor
- All bronze centrifugal pump
- Standard ¼ HP 115 volt quiet capacitor motor
- Thermal overload protection
- Driplip base of heavy structural steel with ½" tapped drain
- Flexible connectors on both suction and discharge of pump, and flexible coupling isolate the pump, preventing pipe cramp and misalignment, which cause wear and noise

OTHER MODELS TO 100,000 SQ. FT. 200 P.S.I.

WALTER H. EAGAN CO., INC.

Mfgs. of Condensate, Vacuum, Turbine, Boiler Feed and Centrifugal Pumps.
Pump Specialists since 1920

WALTER H. EAGAN CO., Inc. (Dept. B) MAIL COUPON TODAY
2336 Fairmount Avenue
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SEND ME FREE DESCRIPTIVE BULLETIN OF THE NEW EAGAN "EAGLE" CONDENSATE PUMP

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CITY ..... Zone . . . State .....

da. The meeting will be preceded by a three-day summer school, beginning June 20, sponsored by the society's industrial engineering division.

AMERICAN SOCIETY OF REFRIGERATING ENGINEERS, 40 W. 40th St., New York 18—Spring meeting, June 27-July 1, Lake Placid Club, Lake Placid, N.Y. The 1953 winter meeting will be held in Washington, D. C. and the 1954 semi-annual meeting in Seattle. The December 1954 annual meeting will be held in Philadelphia. This meeting will mark the 25th anniversary of the Philadelphia section and the 50th anniversary of *ASRE*.

AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS, 62 Worth St., New York 13 — Semi-annual meeting, June 29, 30, July 1, Denver, Colo. For further information see page 139.

AMERICAN SOCIETY FOR TESTING MATERIALS, 1916 Race St., Philadelphia 3—1953 annual meeting, June 29-July 3, Chalfonte-Haddon Hall, Atlantic City.

AMERICAN INSTITUTE OF WHOLESALE PLUMBING & HEATING SUPPLY ASSOCIATIONS — Second annual convention, September 20-23, Waldorf-Astoria, New York. Convention chairman is M. W. Dennison of Braman, Dow and Co., Boston.

INSTRUMENT SOCIETY OF AMERICA, 921 Ridge Ave., Pittsburgh 12 — Eighth National Instrument Exhibit, September 21-25, Sherman Hotel, Chicago.

INTERNATIONAL CHURCHMANS EXPOSITION, 19 S. LaSalle St., Chicago 3 — Second annual exposition, October 6-9, Chicago Coliseum. Hall of Church Designs and International Church Buildings Forum will be featured.

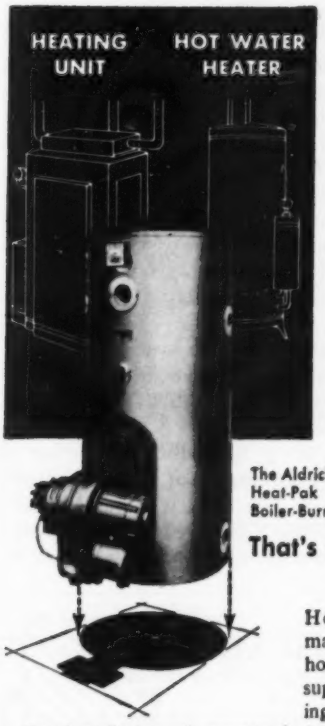
SOUTH CENTRAL REGION, NATIONAL ASSOCIATION OF CORROSION ENGINEERS, 1061 M & M Bldg., Houston 2 — October 7-9, Mayo Hotel, Tulsa. This region consists of the states of Colorado, Kansas, Oklahoma, Arkansas, Louisiana, Texas and New Mexico.

NATIONAL CONFERENCE ON INDUSTRIAL HYDRAULICS—Ninth annual meeting, October 8-9, Sheraton Hotel, Chicago. Sponsored by the Illinois Institute of Technology, Chicago 16, the conference director is Otmar E. Teichmann.

AMERICAN GAS ASSOCIATION, 420 Lexington Ave., New York 17—35th annual convention, October 26-28, Kiel Auditorium, St. Louis. Hotel reservations are available from the Hotels Convention Bureau, American Gas Assoc., Rm. 405, 911 Locust St., St. Louis 1.

EIGHTH ALL-INDUSTRY REFRIGERATION AND AIR CONDITIONING EXPOSITION, 1346 Connecticut Ave., N.W., Washington 6, D.C. — November 9-12. Cleveland Public Auditorium, Cleveland.

ALDRICH
BOILER-BURNERS



The Aldrich Heat-Pak Boiler-Burner

2 HEATING UNITS *in a* SINGLE SPACE

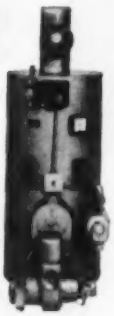
That's the Sales Story to Help You Sell!

Home owners know it makes sense to have BOTH home heat and hot water supply in ONE space-saving unit. Why two separate heating plants and separate fuel supplies? Why not enjoy more usable basement space?

That's the sales story that's making sales for ALDRICH dealers. Tell it and cash in!

YOURS — 90% OF THE HEATING MARKET

ALDRICH BOILER-BURNERS, in a wide range of sizes and capacities, operate on oil or gas, as desired. This gives you access to 90% of the heating market. Also, 60% of home furnaces *cannot provide hot water* supply, as Aldrich units can.



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It's Accurate!
It's Dependable!
It's Self Operated!
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- SUPER-POWER INSTANTANEOUS RESPONSE; Liquid expansion, throttling action, insures positive, constant control.
- OVERLOAD PROTECTION
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NEW BOOKS & REPORTS

Air Conservation Engineering

A second edition of *Air Conservation Engineering* has recently been published by the Connor Engineering Corp. First published in 1944, it is an appraisal of the value of purifying air written by Henry Sleik, vice president and Amos Turk, Ph.D., research director of the Connor Engineering Corp.

In this new edition, the contents have been completely revised to include the latest developments and application methods. Intended as a reference work, the book outlines air purification in theory and practice, cites conditions as they are met and overcome and provides detailed tables and charts for engineers planning an application and estimating its value.

Among the additions is a discussion of air purification in refrigerated storage as a means of retarding the metabolism of fruits and vegetables, the inhibition of specific tissue diseases, protection of foods against organic decay and the preservation of natural flavors. A section on catalytic combustion covers this new method of controlling odors in high concentration and at high temperatures by a process which converts the odorants to moisture and carbon dioxide.

Another important section contains material useful for designing heating and cooling systems.

Priced at $5.00 a copy, the 76-page volume is available from the Connor Engineering Corp., Danbury, Conn.

Body Temperature and Environment

Body Temperature, Its Changes with Environment, Disease and Therapy discusses the physiologic mechanisms responsible for various changes in body temperature. The material has been compiled from more than 200 publications. The style is simple and clearly explains the problems involved. Highly technical physiologic and biochemical terms are avoided as much as possible and the discussions are very well illustrated.

A chapter on "Central Control Centers of the Neural Mechanism of Temperature Regulation," is a condensation of the results gained from extensive physiologic experimentation. It represents a mass of material which has been prepared during the past 15 years and now is being organized.

Considerable information has been included on the effects of exposure of subjects to low temperatures and revival of them from such exposures. Much of this was developed during World War II from studies on soldiers in the Arctic and experiments of controlled exposures to cold.

The book should be most helpful to heating and ventilating engineers who wish to understand the mechanism of the regulation of body heat in relation to changes in atmospheric environment.

Author of the book is W. A. Selle, Ph.D., professor of biophysics and physiology, University of California Medical School, Los Angeles. The book was published by Charles C. Thomas, 301-327 E. Lawrence Ave., Springfield, Ill. and is priced at $3.50—Reviewed by Robert W. Keeton, M.D.

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- EASY TO INSTALL *Anyone Can Do It!*
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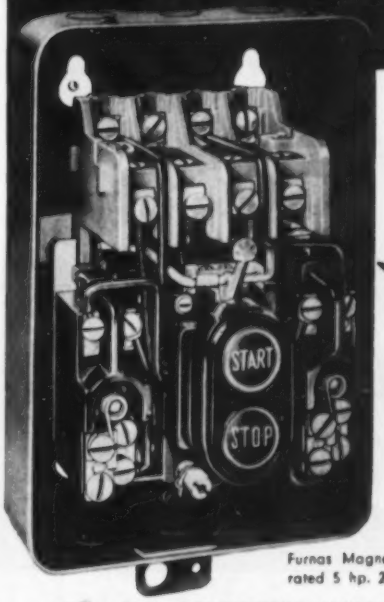

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1952 Book of ASTM Standards

The 1952 *Book of ASTM Standards* recently published contains more than 2000 standards, specifications, tests and definitions for materials and is issued in seven parts. Made up of 9975 pages, it is used as a guide for purchasing materials and evaluating their quality through the standard tests that are given.

The seven sections of the book are: (1) ferrous metals; (2) non-ferrous metals; (3) cement, concrete, ceramics, thermal insulation, road materials, waterproofing and soils; (4) paint, naval stores, wood, fire tests, sandwich constructions, building constructions; (5) fuels, petroleum, aromatic hydrocarbons, engine antifreezes; (6) rubber, plastics, electrical insulation, and (7) textiles, soap, water, paper, adhesives and shipping containers.

Each part of the book is complete with detailed subject index and two tables of contents. To keep the book up to date, a supplement will be issued to each part late in 1953.

Bound in a blue cloth binding, parts 1, 3 and 6 are priced at $12.00 each and parts 2, 4, 5 and 7 at $10. A complete set of all seven parts is $76.00. Copies may be obtained from the American Society for Testing Materials, 1916 Race St., Philadelphia 3.

As a service with the 1952 book, a complete index to standards is furnished without additional charge.

Heat Pump Bibliography

Bibliography of the Heat Pump Through 1951 is a comprehensive listing of about 750 references to published materials on principles, design, operation and applications of the heat pump. References in the 30-page bibliography include articles, books and miscellaneous publications from foreign countries as well as from the United States. Publication dates of the material covered vary from December 1852 through December 1951.

Listings are divided into three sections: signed articles and other publications identified by author; unsigned articles and handbooks identified by the publisher, and books devoted exclusively to the heat pump.

The bibliography originally was compiled by the staff of the 2701st Research and Development Unit at Battelle Memorial Institute for the Signal Corps Engineering Laboratories. It was published by the Joint Association of Edison Illuminating Companies-Edison Electric Institute Heat Pump Committee through the courtesy of the compilers and by permission of the Signal Corps, U. S. Army.

It is available at $1.00 a copy from the Edison Electric Institute, 420 Lexington Ave., New York 17.

ASTM Specifications for Steel Pipe

The ninth edition of *ASTM Specifications for Steel Piping Materials*, sponsored by the ASTM Committee A-1 on Steel, contains the 56 ASTM specifications for carbon-steel and alloy-steel pipe and tubing, including stainless.

Materials covered include: pipe used to convey liquids, vapors, and gases at normal and elevated temperatures; boiler, superheater, and miscellaneous tubes; still tubes for refinery service; heat-exchanger and condenser tubes. In addition there are specifications for castings, forgings and welding fittings and bolts and nuts. New specifications cover: quenched and tempered alloy steel bolts

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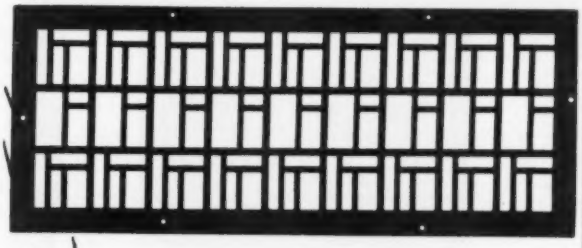

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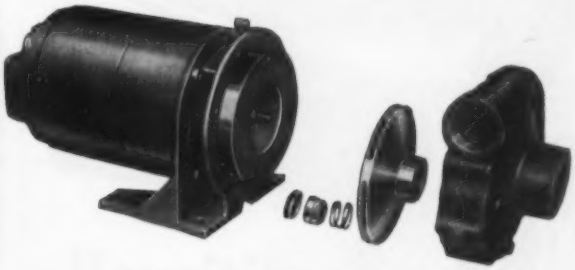
Goulds Fig. 3642 close-cupld centrifugal pump especially designed for air conditioning service. Capacities to 110 GPM. Heads to 120 ft.



Vertically split casing permits you to inspect and maintain pump, or remove motor, adapter and rotating element, without disturbing piping connections.

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COMPACT DESIGN—Fits anywhere. Close-coupled construction requires minimum space. No coupling used.

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Sixteen Emergency Alternate Provisions applying to specifications in this compilation are printed in a special section at the back of the book.

Copies of this 394-page publication, bound in a heavy paper cover, can be obtained from the headquarters of the American Society for Testing Materials, 1916 Race St., Philadelphia 3, at $3.75 each.

OTHER BOOKS AND REPORTS

THE GREATER INDUSTRIAL HEALTH—transactions of the main session of the 17th annual meeting of the Industrial Hygiene Foundation. Reprinted in the bulletin are discussions on: Noise, Its Effects and Cost; Review of the Latest Developments in Outdoor Air Pollution; Management Education and Worker Health, and Sick Absenteeism.

Copies are available from the Industrial Hygiene Foundation, 4400 Fifth Ave., Pittsburgh, at $1.50 each.

GRADUALLY VARIED FLOW IN UNIFORM CHANNELS ON MILD SLOPES—discussion of three well-known methods of integration (direct, approximate and graphical) with special reference to their advantages and limitations. In addition a new method is proposed and test data is presented. The bulletin is available from the University of Illinois Engineering Experiment Station, University of Illinois, Urbana, and is priced at $1.00.

ANNUAL REPORT 1952, *NATIONAL BUREAU OF STANDARDS*—summary of scientific and engineering investigations conducted by NBS during the fiscal year 1952. The booklet contains accounts of current activities as well as descriptions of representative projects in the fields of: electricity, optics and metrology, heat and power, atomic and radiation physics, chemistry, mechanics, organic and fibrous materials, metallurgy, mineral products, building technology, applied mathematics, electronics, and basic instrumentation.

The book is available from the Government Printing Office, Washington 25, D.C., at 30 cents a copy.

STANDARDS—ENGINEERING TOOLS FOR INDUSTRY—proceedings of the Third National Standardization Conference held in conjunction with the Centennial of Engineering in Chicago in 1952. The papers feature standardization experience and practice in industrial construction and home building, chemicals, safety, purchasing, photography, welding, and in the international field.

The booklet is sold by the American Standards Association, 70 E. 45th St., New York 17, for $2.00.

ASSURING PUBLIC SAFETY IN CONTINENTAL WEAPONS TESTS—a report by the Atomic Energy Commission. The booklet covers the major activities of the AEC programs for July through December 1952, a condensed annual financial report and a discussion of public safety in continental weapons tests. It is available from the Superintendent of Documents, Government Printing Office, Washington 25, D.C., at 50 cents a copy.

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Underground Steam Conduit

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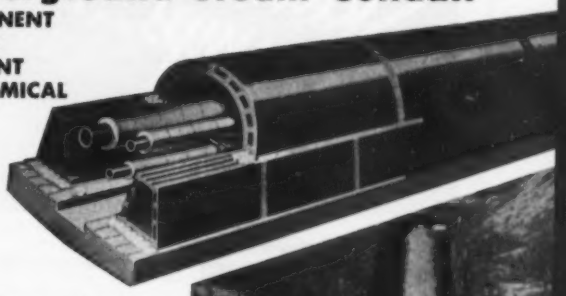

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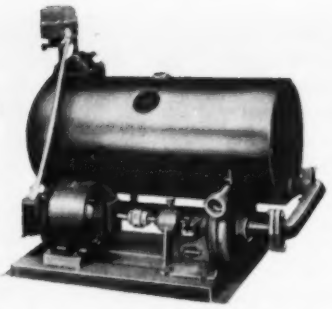

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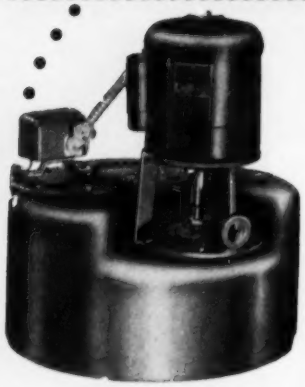
. . . a long record of dependable performance



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RECENT TRADE LITERATURE

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Air Conditioning Sales Analysis

HPAC 101—Two booklets, one for stores and restaurants and the other for industrial and office applications, provide an investment analysis technique which determines how much the installation of air conditioning can boost sales and employee efficiency. The analysis also shows how many years it will take for the air conditioning to pay for itself. Included in the booklets are a fact finding formula, city weather charts and a listing of typical sales increases in various types of businesses. [Publisher: General Electric Co., Air Conditioning Div., Bloomfield, N.J.]

Air Handling Units

HPAC 102—Two-color, 20-page catalog discusses air handling units. It contains complete specifications on central station air handling units and all accessory equipment. Also included is complete information regarding unit selection as well as rating tables for direct expansion, water and steam coils. [Manufacturer: The Bush Mfg. Co., 179 South St., West Hartford 10, Conn.]

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114 116 118 119 120 121 122 123 124 125 126
127 128

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Air Operated Controllers

HPAC 103—Bulletin No. A120 describes instruments for automatic control of pressure, temperature, liquid level, flow, humidity, pH, and electrical variables. Among the new products described are time-program controllers, potentiometers and bridge instruments in air operated control models. Complete data is given on on-off, proportional, reset, derivative, reset plus derivative and autoset types of controllers. [Manufacturer: The Bristol Co., Box 1790, Waterbury 20, Conn.]

Airfoil Centrifugal Fans

HPAC 104—Catalog 1320 describes airfoil centrifugal

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3 to 15 Tons Capacity

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Compact . . Durable . . Easily Installed . . Indoors or Out.

Made of 14-Gauge Copper Bearing Steel.

Coated Inside with Rubberized Asphalt.

Available on Short Notice with or Without Water Pump.

Also Package Type Redwood Spray Towers . . 3 to 30 Tons

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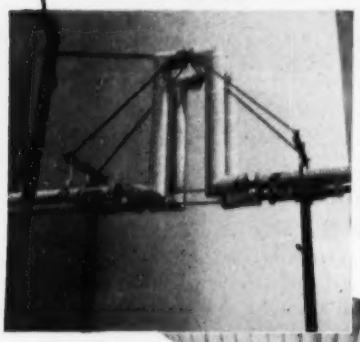
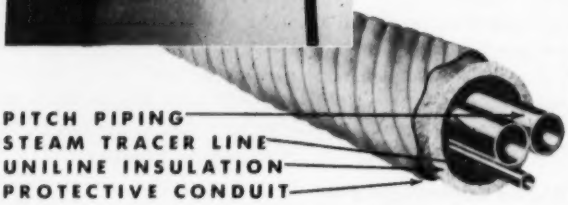
PIPING VISCOUS MATERIALS?

HERE'S HOW A Large Primary Aluminum Producer Solved Pitch Flow Problem with RIC-WIL UNILINE INSULATED PIPING



Design requirements for this overhead pitch handling system called for an insulated pipe conduit capable of heating the pitch from its solid state at 25° F to a minimum pumping temperature of 285° F. and maintaining this temperature.



THE temperatures required are efficiently maintained in Ric-wiL's Uniline System. Pitch piping is nested with a steam tracer line inside an insulation liner which insulates the pipes from the exterior but not from each other. The emission of heat from the steam tracer keeps the pitch in a free-flowing liquid state and at the desired temperature. The entire system is housed within a protective conduit of 16-gauge Armco ingot iron, helically-corrugated and hot-dipped galvanized.

Ric-wiL Uniline Systems are also used to maintain proper flow in piping oil, asphalt, molasses, and many other viscous materials — underground or overhead. Pipe lines subject to corrosive conditions may be coated with Ricwilite, a baked-on phenolic resin having outstanding corrosion resistance and durability

Scientific design of Ric-wiL Insulated Piping, completely prefabricated with all accessories required, assures high thermal efficiency and speedy, low-cost installation.

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fans for mechanical draft, high velocity air conditioning systems, heavy duct industrial applications and vehicular tunnel applications. A graph of the certified horsepower, efficiency and pressure ratings of airfoil fans is presented and the design features which contribute to these ratings are discussed. Brief descriptions of each of the five classes of fans available give maximum wheel speeds, total pressures and volume ranges for each class. Also discussed are construction features of housings, wheels and shafts, and bearings of heavy duty airfoil fans. [Manufacturer: Westinghouse Electric Corp., Sturtevant Div., Dept. T-060, 200 Readville St., Hyde Park, Boston 36.]

Automatic Boilers

HPAC 105—Four-page illustrated booklet describes the company's line of "Continental" automatic boilers. Included are detailed engineering data and specifications and features and advantages of these boilers. The boilers can be used wherever steam is required for applications other than power. The major uses are as heating units and as a source of steam for process industries. [Manufacturer: Boiler Engineering and Supply Co., Inc., Phoenixville, Pa.]

Automatic Packaged Boiler

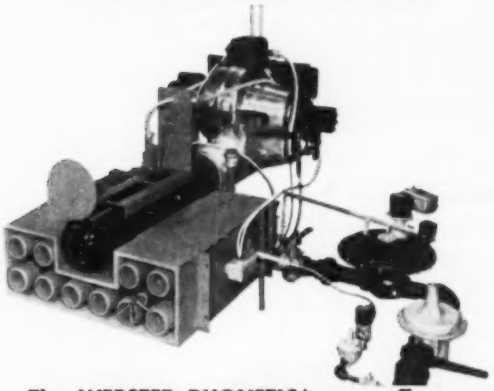
HPAC 106—Bulletin EC-1152 describes and illustrates the "Econo Therm" automatic package boiler. Construction features such as welded boiler shell, stainless steel air ring, rotary combustion and induced mechanical draft are described and shown in cutaway drawings. A complete table of specifications is included. [Manufacturer: Hapman-Dutton Co., 623 Gibson St., Kalamazoo 6, Mich.]

Only ADSCO's exclusive features make maintenance so easy. There's no breaking of pipe connections to inspect or service the trap, because all working parts are mounted on the cover. An extra cover assembly becomes a complete spare trap . . . replace the cover in a matter of minutes, service the original, and the result is a spare trap always ready.

ADSCO traps offer additional exclusive advantages: reversible stainless steel valve and seat double the life of the trap . . . inlet and outlet connections on *both* sides make installation easy and less expensive. Write today for catalog data.

AMERICAN DISTRICT STEAM COMPANY, INC.
NORTH TONAWANDA, NEW YORK
Since 1877

WEBSTER DUONETIC*
for Dual Fuel Firing



The WEBSTER DUONETIC* now offers unsurpassed economy, efficiency and trouble-free operation in the combination oil and gas firing equipment field. Never before have both fuels been burned so well so simply.

You can rely on the usual WEBSTER quality to provide you with the best.

Both burners employ electric ignition; constant electric ignition on the oil burner, and electric ignition for the gas burner safety pilot.

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WEBSTER KINETIC* BURNER

For Low Pressure Gas

The Webster Kinetic consists of a multiplicity of full venturi mixers with flame retention nozzles. These are assembled in a metal casing complete with pilot and louver. It may be used with natural, mixed or liquefied petroleum gases. Standby oil burners may be used when desired.

As a multiple head assembly it is available in 25 standard sizes of from 4 heads to 48 heads, and can be supplied in any size or shape. Natural gas input ratings from 560,000 Btu/hr to 6,720,000 Btu/hr at 4" wc.

For complete information request Series BB Bulletins.

*TRADEMARK

The WEBSTER ENGINEERING COMPANY
TULSA, OKLAHOMA
Division of SURFACE COMBUSTION CORPORATION, Toledo, Ohio

For
SCHOOLS • COLLEGES
HOSPITALS • OFFICE
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assure

safe, dependable air distribution
with

R & G
*Tamperproof
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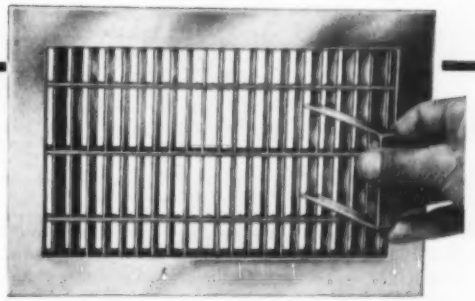
REGISTERS and GRILLES



R & G Style 120, Chromium plated, Solid Bars with Interlocking Cross Bars (fixed or adjustable).

***FAULTLESS OPERATION**
***RUGGED CONSTRUCTION**

Complete Line of Registers and Grilles for
HEATING • VENTILATING • AIR CONDITIONING
Catalog on Request

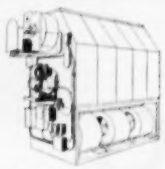
REGISTER & GRILLE MFG. CO., INC.
70 BERRY STREET, BROOKLYN 11, N. Y.

applications unlimited!

with National Champion direct-fired heaters . . .

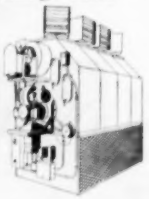
Whatever your heating need, you'll find National Champion direct-fired space heaters meet the requirements. Each unit customed designed for efficient, automatic operation. Versatile, compact, rugged — National Champion heaters.

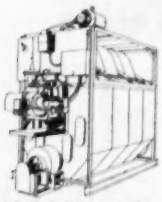
Many models for varied needs!



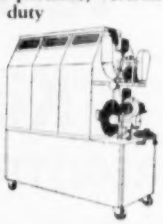
Model "D" — a vertical unit for duct work

Model "H" — A vertical unit with discharge heads

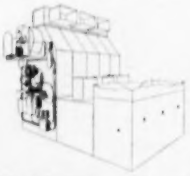


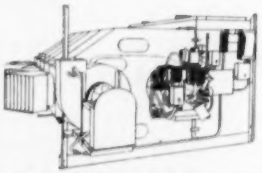


Model "P" — A portable, vertical unit for flexible duty



Model "I" — An inverted unit with discharge heads at bottom





Model "S" — A vertical unit with side blowers to permit proper location of air mixing dampers.

Model "C" — A horizontal ceiling suspension unit for space saving.

Capacities — 200,000 to 2,000,000 BTU/hour.

All National Champion, heavy oil, light oil and gas fired heaters feature teardrop, stainless steel firebox design, electronic flame failure control, pressure type burners and are wired and flame tested at factory prior to shipment.

National Champion direct-fired heaters are listed by Underwriters' Laboratories, Inc.

Information and specifications available upon request from National Heater Company

NATIONAL CHAMPION HEATERS

a product of National Heater Company, Inc.
Dept. A
2180 Cleora Avenue, St. Paul 4, Minnesota

Calculator for Basic Engineering

HPAC 107—Pocket-size desk calculator contains form formulas, constants and conversion factors for basic engineering, blast cleaning and dust control calculations. Included are geometric relationships for circles, squares, cylinders, etc.; measures of pressure, and calculation guides for determining tank capacities in gallons. Formulas for dust control work, tables on shot and grit sizes, and metric measurements and conversion factors are shown. [Publisher: Pangborn Corp., 400 Pangborn Blvd., Hagerstown, Md.]

Dehumidification Data

HPAC 108—Bulletin K-152 gives complete engineering details on "Kathabar" dehumidification systems. Case histories are included of the results obtained in glass, plastic and pharmaceutical companies. [Manufacturer: Surface Combustion Corp., 2375 Dorr St., Toledo 1, Ohio.]

Electric Heater Units

HPAC 109—Bulletin No. E-1 describes the firm's line of electric unit heaters and heater sections for general, industrial and commercial heating. The bulletin illustrates three different types of heaters, and their special features. Engineering data includes capacity tables and dimensional data with mounting heights and coverage. [Manufacturer: L. J. Wing Mfg. Co., 140 Vreeland Mills Rd., Linden, N. J.]

Fiber Glass Insulation

HPAC 110—General information and technical data about the use of fiber glass in the insulation of metal air

PERFORMANCE MEANS PROFITS!

A assured performance
B bearings—guaranteed
C cost—low
D delivery—immediate

Certified Capacity Ratings of WESTERN ROTARY VENTILATORS sell your customers. See Sweet's Catalog.

Remember — you can't look at a ventilator and judge its value. Western Rotary Ventilators have been thoroughly tested and results published. Check Sweet's, A.E.C. or write for catalog. Features lifetime guaranteed bearings — enduring metallic finish on durable galvanized steel. Throat sizes 6" thru 48". Order from your local dealer. The complete line of Western ventilating equipment is handled by wholesalers coast to coast.

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when in the dark...
Look to
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for Outstanding
New Advances in
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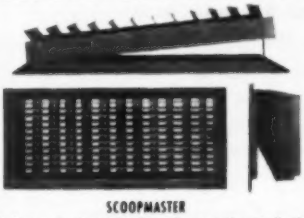
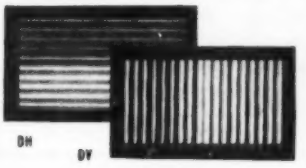
In this Complete Catalog...

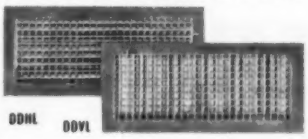
For Quality, Originality, Economy and Fast Delivery—your best choice is Stewart for Industrial and Commercial Registers — Grilles and Air Controls. You'll find one to suit your every need in the new 28 page Catalog #53.



SCOOPMASTER
Eliminates sheet metal collar—directs and controls air

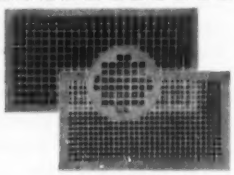


SINGLE BANK OUTLET



Triple Bank Registers Individually Adjustable Fins

Opposed-Action Valves
optional with all Supply and Return Air Registers.



PLAIN LATTICE GRILLES

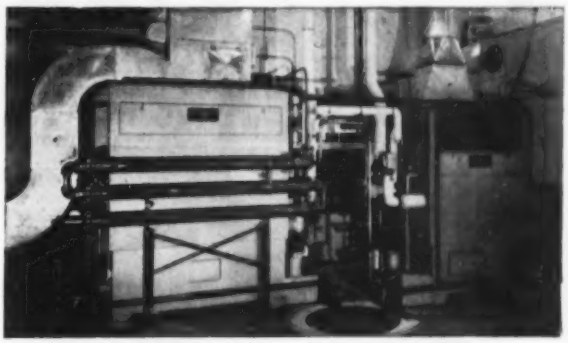
SCOOPTROL
Deflects and controls the air from a supply duct into a collar

Stewart MANUFACTURING CO., INC.
Grove Ave., Essex County, Cedar Grove, N. J.

Representatives in the Principal Cities of United States, Canada and the West Indies.

This NEW METHOD DRIES AIR

PRECISELY AS YOU WANT IT



NIAGARA CONTROLLED HUMIDITY AIR CONDITIONING

This method removes moisture from air by contact with a liquid in a small spray chamber. The liquid spray contact temperature and the absorbent concentration, factors that are easily and positively controlled, determine exactly the amount of moisture remaining in the leaving air. Heating or cooling is done as a separate function.

The Niagara's Controlled Humidity Method using HYGROL moisture-absorbent liquid is

Best and most effective because . . . it removes moisture as a separate function from cooling or heating and so gives a precise result constantly and always. Niagara machines using liquid contact means of drying air have given over 20 years of service.

Most reliable because . . . the absorbent is continuously reconcentrated automatically. No moisture-sensitive instruments are required to control your conditions.

Most flexible because . . . you can obtain any condition at will and hold it as long as you wish in either continuous production, testing or storage.

Easiest to take care of because . . . the apparatus is simple, parts are accessible, controls are trustworthy.

Most compact, taking less space for installation.

Inexpensive to operate because . . . no re-heat is needed to obtain the relative humidity you wish in normal temperature ranges and frequently no refrigeration is used to remove moisture.

The cleanest because . . . no solids, salts or solutions of solids are used and there are no corrosive or reactive substances.

For complete information write

NIAGARA BLOWER COMPANY

Over 35 Years of Service in Industrial Air Engineering

Dept. HP, 405 Lexington Ave. New York 17, N. Y.

Sales Engineers in Principal Cities of U. S. and Canada

Now, thanks to Jenn-Air's engineering know-how, you can get premium quality ventilating equipment at a reasonable cost. Jenn-Air puts an end to complicated duct systems, specially-fabricated mounting brackets, high installation costs, and difficult servicing. Check these Jenn-Air features.

Materials—heavy-gauge, corrosion-resistant aluminum . . . no painting necessary.

Design—ultramodern, roof units rise only 14" to 20" above roof level—lowest contour of any power exhauster—motor mounted entirely out of airstream, not subjected to harmful deposits.

Weight—light but strong aluminum construction saves money on shipping costs—easy to handle and install.

Flexibility—will exhaust from any area accessible by ductwork—excellent for all heat, fume, and dust removing applications—complete in itself, requires no special fittings—perfect for spot ventilating—can be used on almost any type of building.

Send for our free illustrated brochure, c/o Dept. C-5. It contains complete technical data, installation information, and performance records.

JENN-AIR PRODUCTS COMPANY
ARCHITECTS & BUILDERS BLDG. • INDIANAPOLIS 4, INDIANA

ducts is provided in this four-page folder. Included are specifications for "LOF Superfine" fiber glass, drawings showing methods of installation and application of the blanket form fiber glass, tables providing sound absorption data, graphic curves dealing with thermal conductivity coefficients and a list of the company's sales offices. [Manufacturer: Libbey-Owens-Ford Glass Co., Fiber Glass Div., Nicholas Bldg., Toledo 3, Ohio.]

Duct and Fittings

HPAC 111—New catalog on "Muelleraire" furnace pipe, duct and fittings includes information on gravity, graduated trunk and extended plenum systems, small pipe systems and perimeter systems. In addition, the firm's line of registers and grilles are illustrated and described. [Manufacturer: L. J. Mueller Furnace Co., 2005 W. Oklahoma Ave., Milwaukee 15.]

Gas Storage Tanks

HPAC 112—Bulletin No. 331 describes the firm's new line of ASME tanks for large, above-ground LP gas storage facilities. The bulletin emphasizes several new features incorporated in the design of the 285 gal and 500 gal LP gas tanks. [Manufacturer: Scaife Co., Oakmont, Pittsburgh District, Pa.]

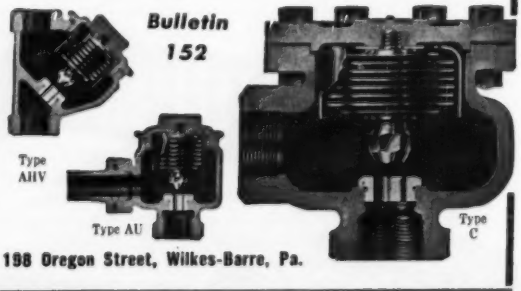
High Capacity V-Belts

HPAC 113—Folder 20B7786 describes high capacity "Texrope" belts. According to the manufacturer, these V-belts carry 40 percent greater hp rating, are oil resistant and static conducting. The belts are recommended for use

NICHOLSON TRAPS

SAVE CAR OF COAL WEEKLY

Following replacement of all steam traps, of various makes, with Nicholson units, an Eastern college reports "an average coal saving of 1 carload per week besides much better heat distribution." Credit is given the higher and more even temperatures which Nicholson traps effect. See why large industrial and institutional steam users are increasingly standardizing on Nicholsons. 5 types; for heat, power, process; sizes ¼" to 2"; press. to 250 lbs.



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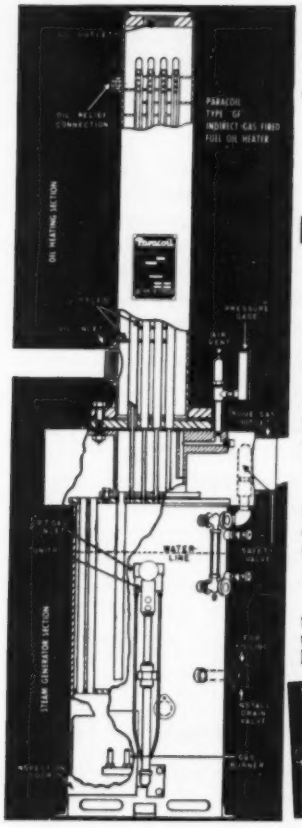
W. H. NICHOLSON & CO.
TRAPS · VALVES · FLOATS



WHY BURN EXPENSIVE LIGHT FUEL OILS . . . . . THERE'S A WAY OUT WITH OUR

Paracoil TYPE "GF"

INDIRECT GAS FIRED FUEL OIL HEATER

A RADICALLY NEW APPROACH TO THE PROBLEM OF ADEQUATE OIL PREHEATING UNDER ALL OPERATING CONDITIONS!

The Type "GF" Oil Heater is an integrated self-contained steam vapor generating exchanger using gas as its primary heat source.

However, the gas flame does not come in contact with the tubes containing the fuel oil. Instead, vapor from the lower steam generating section does the actual oil heating!

APPLICABLE TO ALL TYPES OF OIL FIRED APPARATUS!

As it is not dependent upon the unit it is servicing for the means of heating the oil, the Type "GF" Heater can be applied to any oil fired apparatus, be it a steam or hot water boiler, a process oven, a dryer or a kiln!

A COMPLETE SOLUTION TO THE OIL-IN-BOILER PROBLEM!

As the Type "GF" Heater is in no way connected to the steam or water space of any boiler it may be serving, there can be no possible contamination of the boiler heating surfaces in the event of an oil leak in the heater.

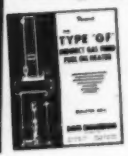
CHECK THESE FEATURES!

Completely factory assembled • Easy to install anywhere, even outdoors • Requires only minimum of floor space • Economical to operate • Wide range of oil heating capacities • Burns any specified type of gas fuel • High oil temperatures at all times • Operation unaffected by normal variation in viscosities of oils being heated • Reduces oil consumption through improved fuel combustion.

THE PERFECT HEATER FOR:

- Low temperature forced hot water heating systems on No. 6 oil.
- Plants with starting difficulties after week end shutdowns.
- Supplementing inadequacies in present oil preheating systems.

Approved by Board of Standards and Appeals, City of New York—Cal. No. 362-51SA



BULLETIN 60-L

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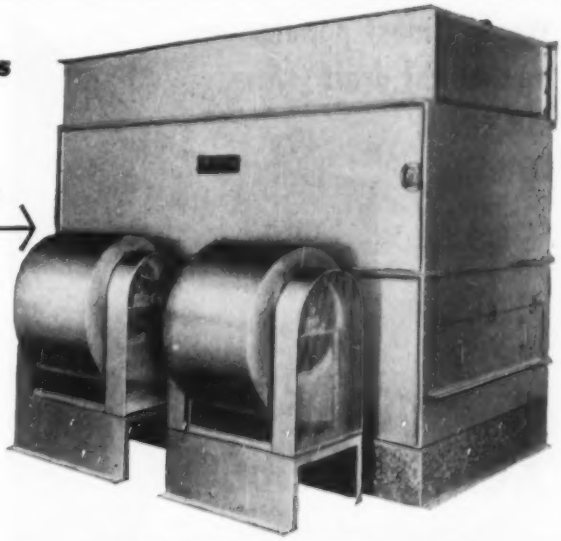
DAVIS ENGINEERING CORPORATION

30 ROCKEFELLER PLAZA NEW YORK 20 NEW YORK • 1084 EAST GRAND STREET ELIZABETH 4 NEW JERSEY

where Cooling Towers must be QUIET...

specify Binks new Series "B" Towers



Binks Series "B" Mechanical Draft Towers are establishing new performance standards for NOISE-FREE operation because they employ squirrel-cage blowers operating at slow speeds. Their design also provides much simpler maintenance because the operating parts are located in the DRY AIR stream—never come in contact with corrosive, moist exhaust air.

Available in capacities from 1 to 109 tons, Binks Series "B" Towers are ideal where quiet operation is essential—for example, hospitals, hotels, apartment buildings, private homes, commercial establishments, etc.

Binks Manufacturing Company
3118-38 Carroll Ave., Chicago 12, Ill.

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EVERYTHING FOR WATER COOLING

Engineering data...FREE!

Send coupon for informative bulletins containing selection tables, dimension data and general specifications about Binks complete line of natural and mechanical draft cooling towers. Absolutely no obligation.

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Gentlemen: Please rush me Bulletins on the following towers:

☐ Natural Draft ☐ Blower-Type ☐ Propeller-Fan

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A COMPLETE LINE OF NATURAL DRAFT AND MECHANICAL DRAFT COOLING TOWERS AND INDUSTRIAL SPRAY NOZZLES

REPRESENTATIVES IN ALL PRINCIPAL CITIES • SEE YOUR CLASSIFIED PHONE DIRECTORY

CUSTOM-FIT* ENCLOSURES
with AIRFOIL* Finned Radiation
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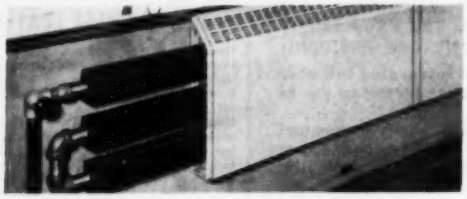
• Modern, streamlined heating installations to fit any architectural need.
• Low cost radiation units which are simple to install and have a custom-made look.
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Made by the producers of famous . . .
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BASEBOARD HEATING
*TRADE NAMES OF . .
RADIANT-RAY RADIATION, INC.
900 W. MAIN STREET NEW BRITAIN, CONN.

in tight spots, for compactness, for changed peak loads, for resisting oil, weather and chemicals, for cutting sheave costs, and where static is a factor. [Manufacturer: Allis-Chalmers Mfg. Co., 1171 S. 70th St., Milwaukee.]

Humidity Measurement

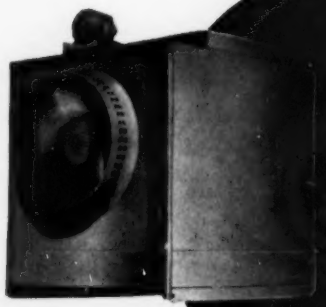
HPAC 114—Instrumentation data sheet No. 10.5-4a describes a new concept of humidity measurement that makes possible direct humidity readings from remote locations. Emphasis of the bulletin is on electronic controlling and recording of humidity for industrial air conditioning. [Publisher: Minneapolis-Honeywell Regulator Co., Industrial Div., Wayne and Windrim Aves., Station 64, Philadelphia 44.]

Indicating Flow Meter

HPAC 115—Illustrated manual describes the application, installation and construction of the "Type H" indicating flow meter. The manual explains the principles of orifice metering and illustrates the company's orifice flanges recommended for use with the instrument. The meter is used for indicating flow rate of air, oil, gas, water, steam, etc. Proper procedure for installation in liquid, steam and gas lines is detailed in line drawings. Copies will be sent in answer to requests on letterheads. [Manufacturer: Meriam Instrument Co., 10920 Madison Ave., Cleveland.]

Indicating Thermometers, Tachometers

HPAC 116—Specification sheet 115 describes indicating pyrometers, resistance thermometers and tachometers of

World's most popular mechanical draft COOLING TOWER...

the Marley AQUATOWER
The simple, fool-proof mechanical draft tower for any job requiring 2 to 60 tons of refrigeration. Stocked in a wide range of sizes and models in 30 cities for immediate delivery. Can be located indoors or out to fit the requirements of any commercial or residential cooling job. See your Marley Representative, or write for Bulletin AQ-53.
MARLEY The Marley Company
Kansas City, Missouri

TYPE F43A

A DUAL SWITCH THERMOSTAT FOR USE FROM -150° F to +600° F
Manufacturers with thermal control problems similar to those encountered in water baths, industrial ovens, hot plate presses, coffee roasters and heating equipment should investigate the Type F43A dual switch thermostat. It is a precision-built temperature control available with a wide variety of thermal assemblies and switches for use between -150° F and +600° F. It can control two separate circuits simultaneously as required, for instance, in an air conditioning system where a fan control and compressor control are required.
Write for bulletin #3-4 which gives full specifications.
UNITED ELECTRIC CONTROLS COMPANY
87 School Street, Watertown, Mass.
STANDARD & SPECIAL THERMOSTATS & PRESSURE SWITCHES

—JEFFERSON—

AIR TESTED MALLEABLE IRON UNIONS

Plainly Marked for Your Protection

Be sure to look for the cast-in-metal "JEFFERSON" and the figures giving rated working pressure and size, before you buy unions. These markings are for your protection . . . . to assure your getting genuine "JEFFERSONS" and to help you check the right size you need for a given use.

Remember this: "JEFFERSONS" are Underwriters' approved for 2000 psi non-shock O.W.G. in sizes to 2-in. and 1000 psi to 4". These ratings are the result of such "Jefferson" features as: air furnace malleable iron having a tensile strength of 55,000 psi, seamless drawn steel tubing seat rings, a truly spherical ball joint and the exclusive Jefferson Recessed Brass Seat.

Jefferson also manufactures: AAR male and female unions, Enduro 300#, Excel 250# and Master 150# unions. All types are also available with all-iron seats.

Contact your nearest distributor or us direct for your requirements.

JEFFERSON UNION CO.

607 West 26th St., New York 1, N.Y.

35 Fletcher Ave., Lexington, Mass.

65 Gooding St., Lockport, N.Y.

SAVE 50% ON CHECK OUT TIME

It's No Problem to balance air distribution in half the time when you use Wa-Trol, the modern air regulator. Indicator shows at a glance the exact position of the damper.

No tools are required to make adjustment. A simple twist of the wrist opens or closes the damper.

Positive locking in any position. Push and turn to the correct setting. Release the knob and it stays where you want it.

It Will Pay to Investigate

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WA-TROL

Wa-Trol

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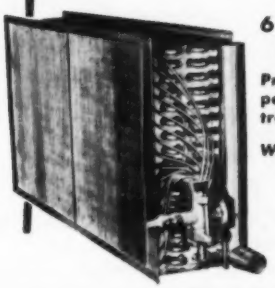
Air Cooling COILS

2 to 15 Ton CAPACITY

NEW Complete Line REMPE

COMPLETE WITH MULTI-OUTLET EXPANSION VALVES MADE-ON— READY TO INSTALL



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Precision built to insure top performance and to give trouble-free service.

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Complete facilities for fabrication of pipe coils — all types — all materials. Engineering service. Send details for price.

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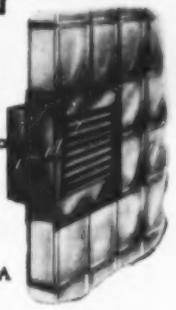

A

Model A fits easily into glass block construction by removing 4 blocks. Model B fits any wall thickness. Both models have air opening of 10" x 14" and pass 1000 CFM at .0625" static air pressure.

B

Muckle

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For complete information on Muckle Fresh Air Intakes.

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Analyze for CO, CO_2, O_2 with one instrument

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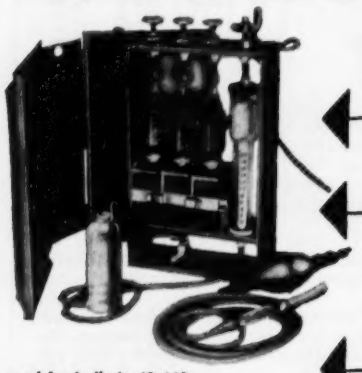

Complete—3 absorption units provide complete gas analysis for all the operating engineer's needs.

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the high resistance millivoltmeter type. Construction and engineering details are given. [Manufacturer: Minneapolis-Honeywell Regulator Co., Brown Instruments Div., Station 64, Wayne and Windrim Aves., Philadelphia 44.]

Induction Motors

HPAC 117—Brochure presents the company's complete line of drip-proof induction motors. Included are speed-torque curves, frame number charts, dimensions and specifications for motors from 1/3 to 150 hp and descriptions of variations for optional mounting and special purpose applications. The new bulletin also covers recent changes in design including the use of prelubricated sealed ball bearings. Address requests to Richard R. Knierim, Sales Manager, The Lima Electric Motor Co., Dept. 10, Lima, Ohio.

Liquid Diffusion's Uses in Power Plants

HPAC 118—Folder discusses liquid diffusion in power plants. Included are discussions of the method of operation and applications in dust control in coal handling, fly ash control, coal storage and boiler cleaning. [Manufacturer: Johnson-March Corp., 1724 Chestnut St., Philadelphia 3.]

Mechanical Draft Cooling Towers

HPAC 119—Performance data and specifications for "Type 3-B" mechanical draft cooling towers are given in bulletin 47-B. The towers, with single blower, twin blowers or triple blowers, are of spray-deck construction and use squirrel cage blowers to create mechanical forced draft. [Manufacturer: Binks Mfg. Co., Water Cooling Div., 3122 Carroll Ave., Chicago 12.]

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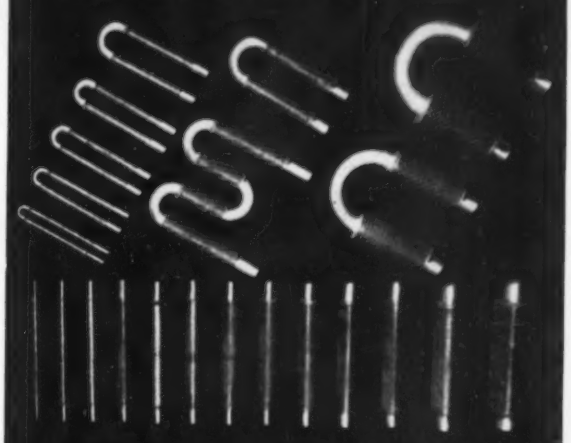

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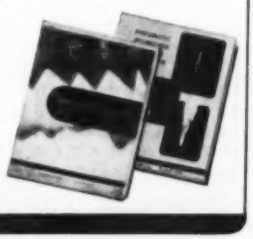

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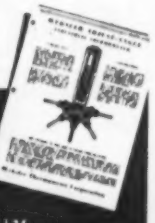

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Motor-Generator Reference

HPAC 120—A motor and generator reference booklet, 51R7933, to assist in the selection of motive power to handle most industrial applications, has recently been made available. The 50-page pamphlet is reprinted from the 1952 edition of *Lincoln's Industrial-Commercial Electrical Reference* published by the Electrical Modernization Bureau, Inc. [Available from: Allis-Chalmers Mfg. Co., 1176 S. 70th St., Milwaukee 1.]

Power Saw Applications

HPAC 121—Twenty-four page manual discusses cutting applications with a portable power saw. The booklet lists 30 different materials and the most effective method of cutting them with a portable power saw. Information includes proper blade selection, proper cutting technique and helpful hints and suggestions. [Manufacturer: Skil Corp., 5033 Elston Ave., Chicago 30.]

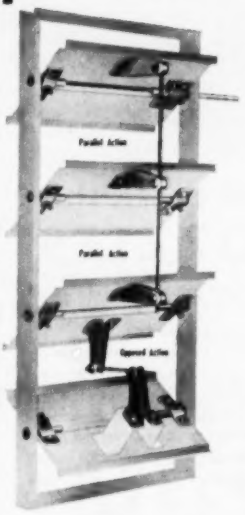
Pre-Hardened Alloy Steel

HPAC 122—Folder gives information on "Carilloy FC", a free-machining grade of prehardened alloy steel. Included are typical uses, savings which can be realized, chemical and physical properties and information on actual users' experiences. [Manufacturer: United States Steel Supply Div., United States Steel Corp., 208 S. LaSalle St., Chicago 4.]

Pressure Regulating Valves and Controls

HPAC 123—Bulletin S-22-CA describes company's line

Engineers • Manufacturers & Fabricators



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Specify and use the . . .

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PRECISION-ENGINEERED DAMPER HARDWARE

- **Produces highest quality damper.**
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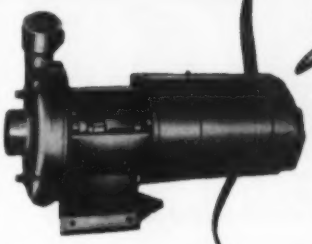
For AIR CONDITIONING and Hot Water Circulating



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Here is a standard diaphragm regulator that can handle your *special* pressure control requirements. It is furnished in a wide range of sizes, types (self-contained, instrument or pilot control), bodies, and trim, to your specification. For water, oil, steam, air or gas. No. 119 single seated, No. 114 double seated, sizes ½" to 6", screwed, standard or extra heavy flanged. Direct or reverse acting. Tested and approved by leading engineers and contractors—the answer to your regulator problems.

No. 114 & No. 119 REGULATOR

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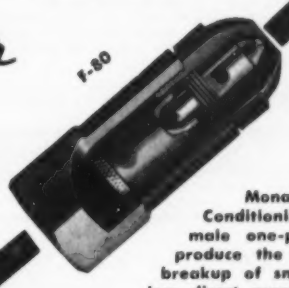

Monarch Brass F-80 Air Conditioning Nozzles (or ⅛" male one-piece H-261 style) produce the finest possible breakup of small capacities with low direct pressure only. No air required.

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Available in 25 different capacity sizes from .57 gph upwards, all Brass construction with 120 mesh Monel screen strainers.

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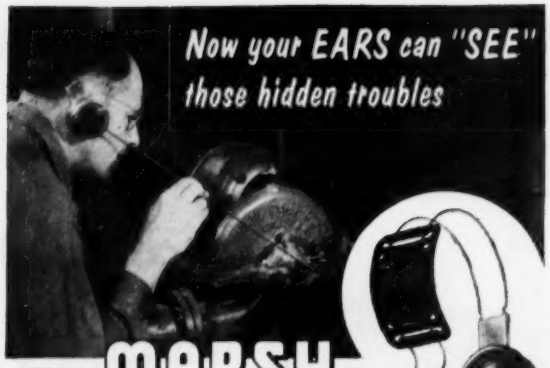

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Most effective instrument ever developed for pin-pointing and identifying mechanical defects. Saves time and dollars tracking down troubles in bearings, gears, mechanisms . . . detects leaks, knocks, piston slaps—any defects that make a sound. A precision instrument of Marsh quality, sensitive to faintest sounds . . . with handy probe and headband as illustrated. A remarkable tool, moderately priced.

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Ask for Circular

of pressure regulating valves and pressure master controls. Printed in three colors and punched to fit three-ring binders, the catalog is illustrated with photographs, cutaways and section views, dimensional and specification data. It describes in detail diaphragm-operated spring-opening and spring-closing regulating valves, pressure controllers, air locks, valve positioners, and selector panels. The bulletin also lists the firm's representatives throughout the United States, Canada and Mexico. [Manufacturer: The Swartwout Co., 18511 Euclid Ave., Cleveland.]

Seals for Air, Gases and Liquids

HPAC 124—Brochures briefly describes the firm's products and services for sealing bolts, studs, rivets, AN fittings, access doors, hatch covers, flanges, electric terminals, etc., for sealing in air, gases or liquids. [Manufacturer: The Franklin C. Wolfe Co., Inc., 3644 Eastham Drive, Culver City, Calif.]

Telemetering

HPAC 125—Bulletin M1710 on telemetering contains information on the use of the company's "Metameter" telemeter for remote measurement and automatic control of variables. Up-to-date information and engineering data is given on new methods of telemetering. The company's electric "Dynamaster" transmitters and receivers are described and information is given on various methods of transmission including telephone circuits, microwave, carrier current, etc. A number of typical installations are illustrated and described. [Manufacturer: The Bristol Co., Box 1790, Waterbury 20, Conn.]

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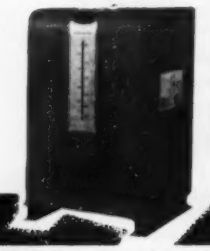

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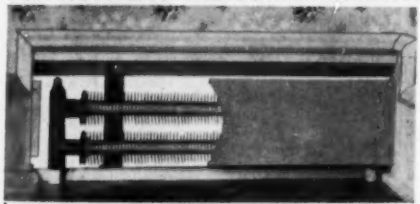

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You can make a double or single tier assembly.

Standard Baseline enclosures accommodate one or two tier heating elements as required. NEW — Pat. Pend. floating hangers, eliminate expansion and contraction noises of heating element. Plus finger-tip damper control—even heat output and labor saving installation features make Baseline a Better Baseboard. Contractors — for industrial heating Baseline and Basevector are money savers.

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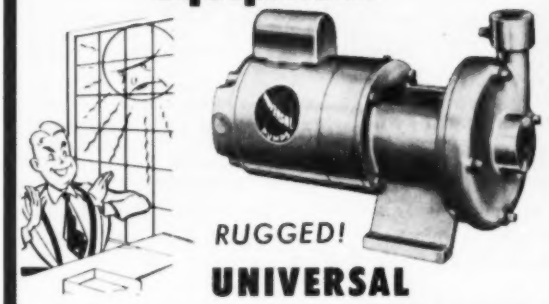

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- Series WXH Low Priced
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Available from ⅛ HP through 5 HP . . . designed for efficient, dependable operation . . . ideal for air conditioning, with large capacities at moderate heads. Write for descriptive circular.

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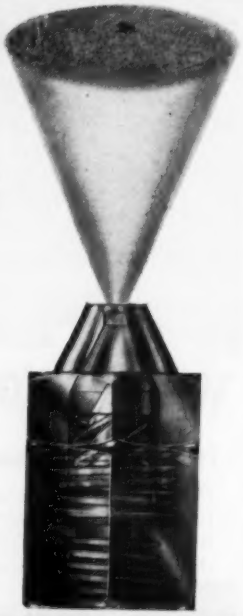

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—and many other industrial uses.

Write for Catalog 31

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GRAND AVENUE & 4TH STREET
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Valves

HPAC 126—Circular No. 577 describes graphically the dimensions and features of the "Renewo" valves which are designed to permit the inter-changing of matched seats and discs for the conversion of valves from full way to plug types. The arrangement of the circular is designed to make possible an accurate selection of a valve by checking the desired pressure class and the type. [Manufacturer: The Lunkenheimer Co., Box 360-U, Cincinnati 14, Ohio.]

Wall and Roof Power Exhausters

HPAC 127—Bulletin 53-B features the firm's improved line of wall and roof power exhausters. New range of capacities, sizes and designs are shown. [Manufacturer: Jenn-Air Products Co., Architects & Builders Bldg., Indianapolis 4.]

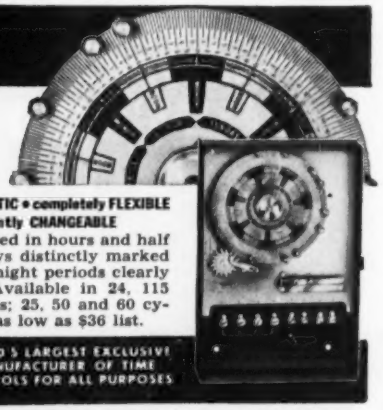
Water Heaters and Coolers

HPAC 128—Eight-page brochure consists of illustrations and line drawings of the company's line of water heaters and coolers. Accompany diagrams on every page show how each individual unit functions. Also there are several tables dealing with heater selection, sizes, capacities and dimensions, which tell how to select a heater or converter depending on the technical conditions to be met. [Manufacturer: Manning & Lewis Engineering Co., 28-42 Ogden St., Newark, N.J.]

Here's how to **CUT YOUR CUSTOMERS' FUEL BILLS**

Always Install a PARAGON 700 Series 7-Day Calendar Time Switch

When you install a 700 Series Time Switch on a heating job, you insure economical operation — and customer satisfaction. For example, it's simple to set the dial to switch to a lower thermostat setting *automatically* Saturday noon, then switch back to the higher setting earlier than usual Monday. At the same time a regular switching schedule for night shutdown of the heating system can be maintained the rest of the week. You can accurately set operations from ON to OFF or from OFF to ON as close as 3 hours apart . . . at *different* hours each day if necessary . . . or you can omit any days desired. You can set it in advance for automatic control of a week's operations — yet make changes instantly when necessary! Send for complete details — now! Ask for bulletin No. HP-5207.



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Dial graduated in hours and half hours — days distinctly marked — day and night periods clearly separated. Available in 24, 115 and 230 volts; 25, 50 and 60 cycles. Prices as low as $36 list.

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WORLD'S LARGEST EXCLUSIVE MANUFACTURER OF TIME CONTROLS FOR ALL PURPOSES

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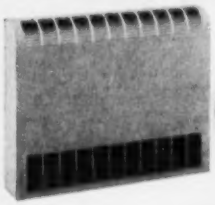

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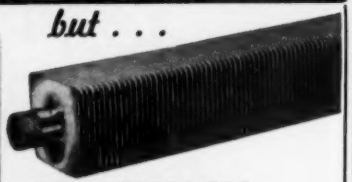

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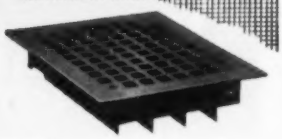

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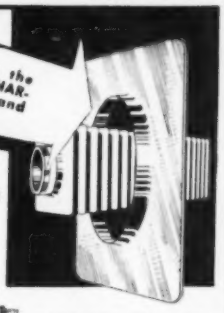

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Mechanical Engineer, age 23, married, BME. Two years experience in designing, estimating, selling and supervising heating, ventilating and air conditioning installations. Desires similar position, west coast, southwest or east coast. Address Key 1032A, Heating, Piping & Air Conditioning, 6 No. Michigan Ave., Chicago 2, Ill.

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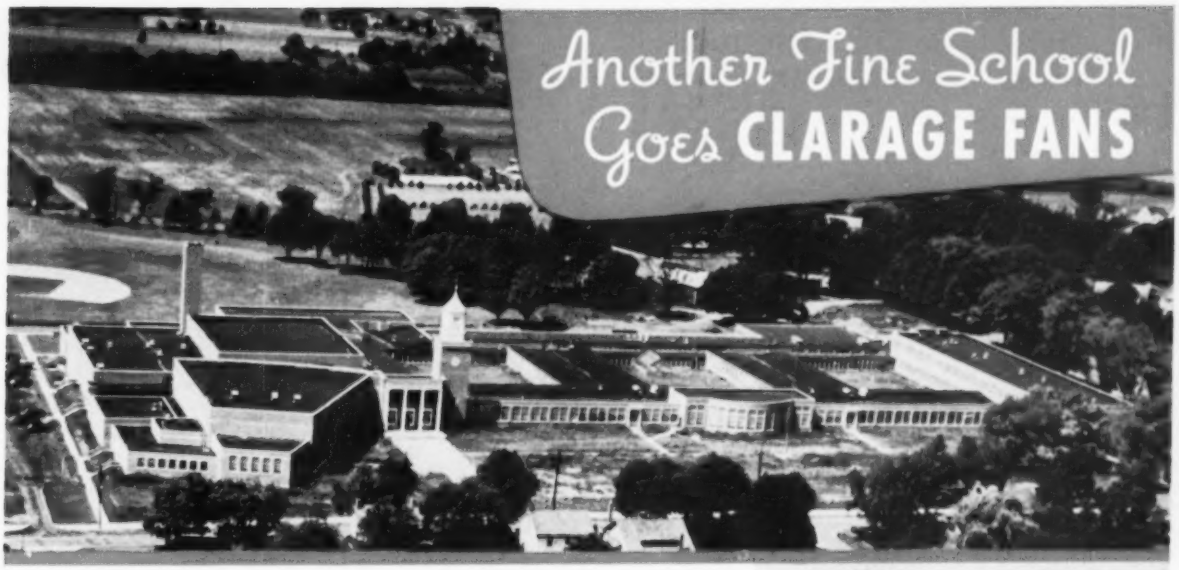

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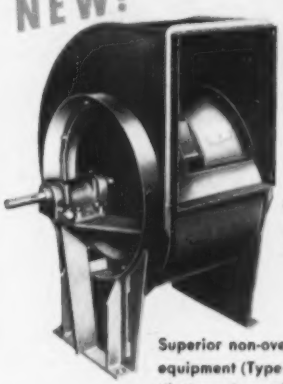

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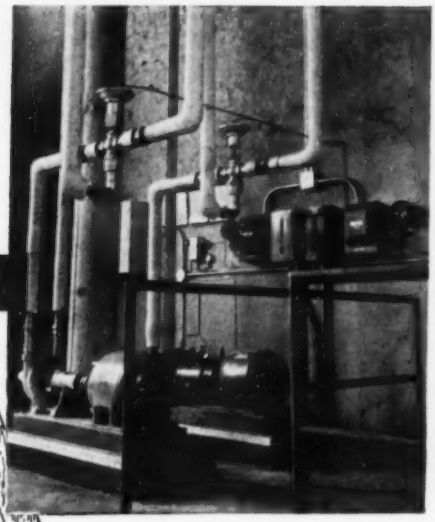
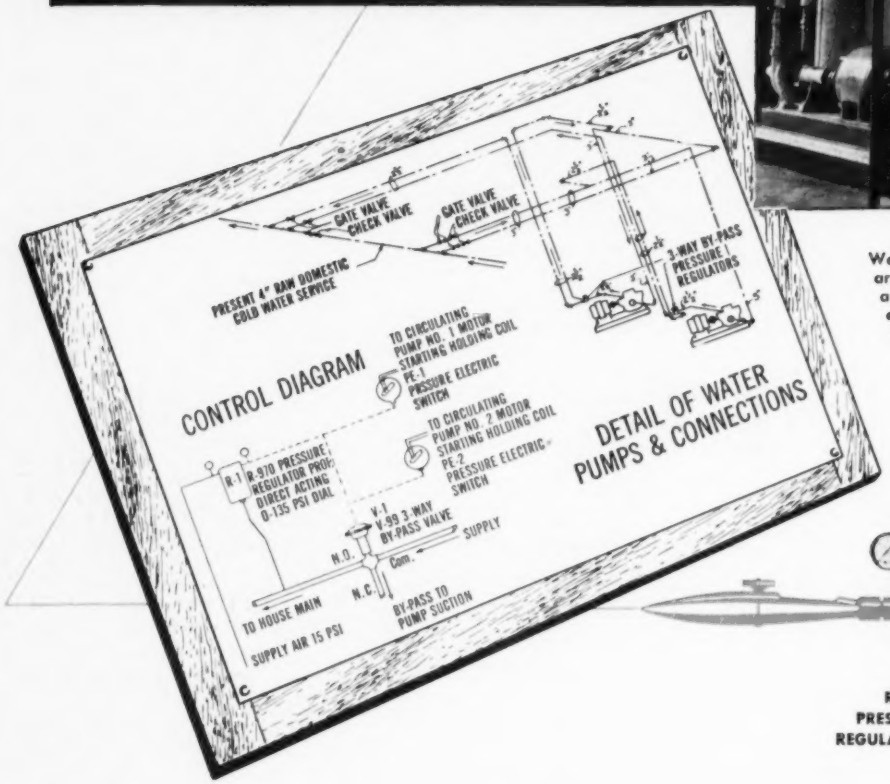
the chances are...

YOU may have a

WATER PRESSURE PROBLEM



Water Pump Installation, Marillac Seminary, Normandy, Mo. Maguolo & Quick, architects; Harry F. Wilson, mechanical engineer; McNamara Equipment Co., mechanical contractors, all of St. Louis.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3-WAY BY-PASS PRESSURE REGULATORS
PRESENT 4" RAW DOMESTIC COLD WATER SERVICE
CONTROL DIAGRAM
TO CIRCULATING PUMP NO. 1 MOTOR STARTING HOLDING COIL
PE-1 PRESSURE ELECTRIC SWITCH
TO CIRCULATING PUMP NO. 2 MOTOR STARTING HOLDING COIL
PE-2 PRESSURE ELECTRIC SWITCH
R-1 R-970 PRESSURE REGULATOR PROP. DIRECT ACTING 0-135 PSI DIAL
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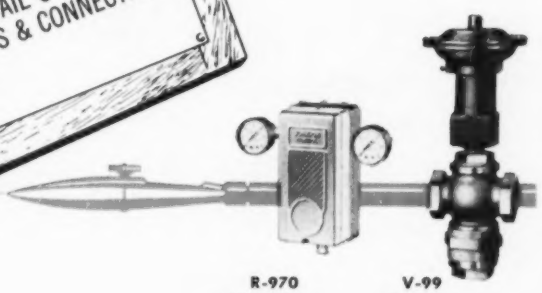

R-970 PRESSURE REGULATOR

V-99 3-WAY BY-PASS VALVE

Eliminate inefficient operation and the possibility of complete shut-downs due to low water pressure! The Johnson Control hook-up, shown here, solves the problems.

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